MODERN PLASTICS

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Dr. G. M. KLINE, Technical Editor

Of General Interest

Cover color this month is CAPRI GREEN
(created by Textile Color Card Association)

Technical Section

News and Features

Next Month

The growing importance of organic plastics in the United States has been evidenced by a phenomenal growth in production and consumption, particularly in recent years. It is fitting, therefore, that in our annual year book, which appears next month, we have brought the story of the various materials and their development and handling up to date and the more than three hundred pages of this issue are filled with information obtainable in no other place.

The Properties Chart, which has proved so helpful during the last year, has been revised and much of the information which was missing last year, has been supplied. Physical properties of the newer plastics have been added and the Directory Section has been re-written and revised.

Fifty-two articles written by competent authors in this interesting field bring complete information of organic plastics to our readers for the second time and the subject of injection molding, which is of great interest to industry, is thoroughly described as are the presses and plastics required for this new means of production.

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INSUROK
by RICHARDSON

INSUROK, the superior laminated or molded plastic, is available in a multitude of forms with a grade and thickness for every industrial need. For high heat resistance; toughness; severe mechanical service; high dielectric resistance; unusual wear- and shock-resisting qualities . . . laminated INSUROK is the accepted material for the electrical industry.

As custom molders of all types of synthetic resin plastics, bituminous and hard rubber products, Richardson offers you the facilities of its Research, Design and Engineering Departments without obligation.

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MODERN PLASTICS
SEPTEMBER 1937 VOLUME 15 NUMBER 1

PLASTICS: NO. 2 REFRIGERATOR MATERIAL

by FRANKLIN E. BRILL
General Plastics, Inc.

Housings are still made of metal or wood but plastics are rapidly replacing them both in interior and exterior appointments

IN LITTLE MORE THAN A DOZEN YEARS MEchanical refrigeration has become one of America's largest industries, doing a business of over $341,000,000 in 1936. Before the revolution started, the materials used in constructing "ice-boxes" were few and traditional in nature. Zinc sheets formed the inside lining and wood and varnish provided exterior and frame.

Today the mechanical refrigerator uses a great variety of materials, ranging from paper to fused glass, from glycerine resin to thermostat silver. But of all the new materials now used none have gained acceptance more rapidly than synthetic plastics, which is now actually number 2 refrigerator material, ranking second only to steel in variety and extensiveness of its uses.

First recorded use for plastics in refrigerators was a small cold control knob, but today a camera tour through any appliance showroom shows some twenty odd different plastic applications many of them new.

Among them: vegetable drawer fronts, crisper trays (covers), molded (and laminated) breaker strips, molded corner trim, name plates, shelf supports, knobs, interior light housings, thermostat covers, expansion valve housings, handles and hinge-caps, thermometer cases, door latches.

Rapid though this growth may seem—most of it occurring in the last six years—it can be traced directly to the materials themselves rather than any intense promotion. For plastics would seem to have been invented especially for refrigerators, so well do they answer requirements. These synthetic materials have ideal properties: a clean sanitary appearance; a smooth, stainproof and chip-proof luster; resistance to moisture, food

1. Molded phenolic crisper trays are convenient, light weight, resistant to moisture and acids, and they're non-clattering as well. This one is Sparton's. 2. Kelvinator's thermostat housing and control knob are molded of a special odorless phenolic plastic to prevent corrosion around the inner mechanism. 3. Other Kelvinator applications include urea molded light shade, thermometer, shelf supports and crisper drawer fronts

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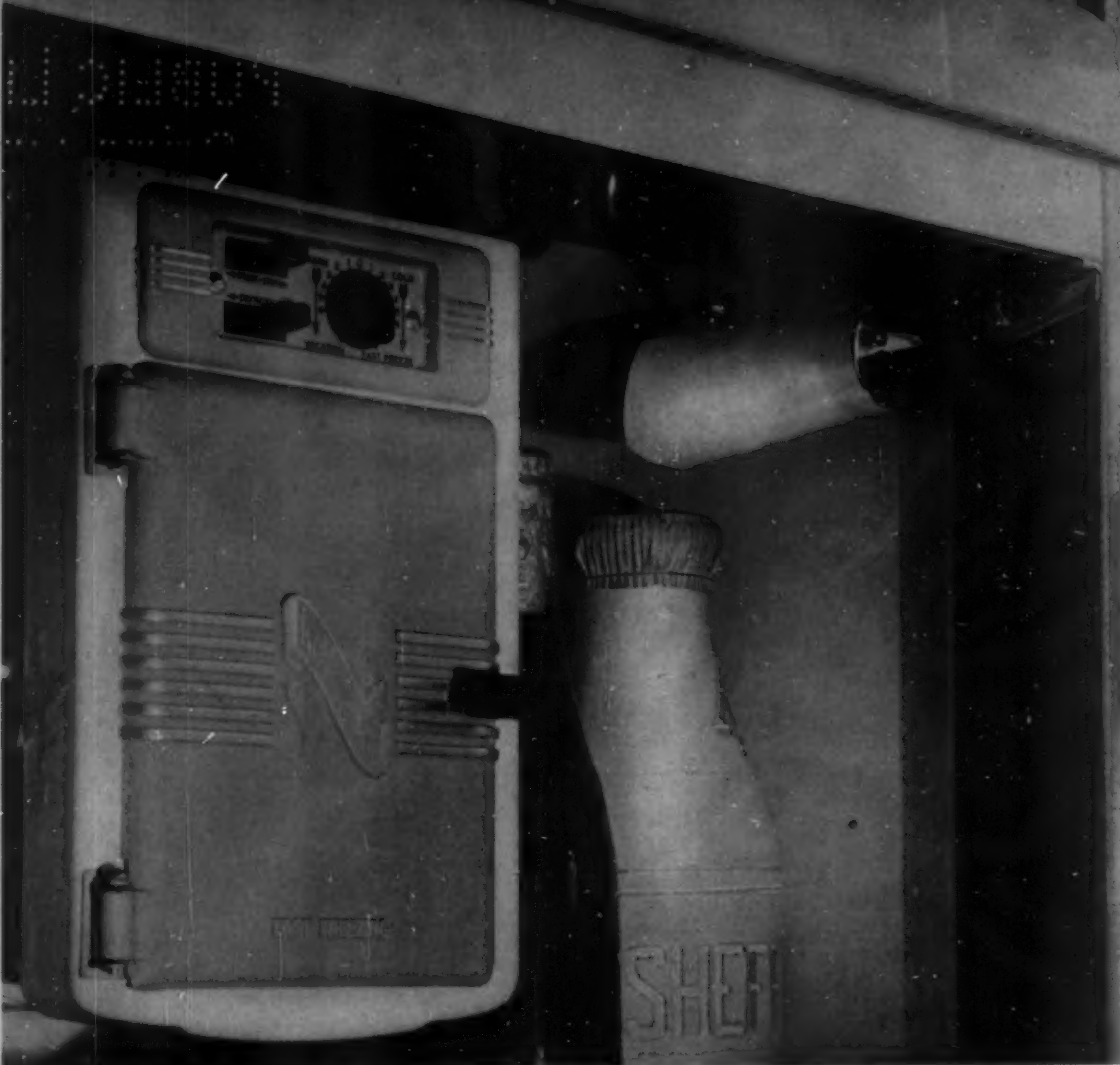

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acids and corrosion; they take intricate shapes economically, and are readily available in the large quantities the industry now requires.

Typical of the newer uses for plastics in refrigerator interiors are the front panels on vegetable drawers or crispers, which are entirely molded in one piece with recesses for metal handles. Contributing much to the clean and attractive appearance of the interior, these panels withstand years of handling without wear or damage to the surface luster, feel pleasant and non-metallic, and are light in weight. Similarly, several recent models use molded serving trays as covers for crispers or defroster dishes, where they perform both tray and cover jobs perfectly, resisting soap, water, acids and chipping, and, being non-resonant in nature, reducing clatter and noise as well as damage to themselves when banged on metal crisper or drainboard.

Molded vs. laminated

Another interesting use for *molded* plastics is the fabrication of breaker strips for doors and jambs, where laminated phenolic materials are usually specified. Not every refrigerator manufacturer can mold his breaker strips because of the different sizes and small quantities required, making sawed and drilled sheet plastics more economical in most cases. But where conditions permit, molded strips have the advantages of being fabricated in one operation including holes and mitres, and having edges sealed, smoothed and bevelled automatically. One manufacturer uses laminated strips but joins the corners with molded phenolic angle-trim which rounds the inside corner and makes cleaning of this difficult place quite simple.

Coming outside of the box for a moment we find several decorative and structural uses for plastics, among them handles of different types. One manufacturer uses smart molded handles threaded over metal cores, matching hinge caps which are molded hollow and snap over the unsightly end portion of the door hinge. Other makers use molded plastics for the protruding portion of the "push-release" type of handle, while still others use an extra-strength, self-lubricated plastic for the latch itself. Name plates and vegetable bin handles complete the present exterior uses for plastics, and are chosen in the former case for the sharp detail possible, and in the latter for smoothness and pleasing feel.

Mechanical parts and accessories employ increasing amounts of plastics, too, a typical mechanical use being molded housings for thermostatic expansion valves, where the delicate mechanism must be sealed against dirt and moisture, and where the plastic is a guarantee against rust and corrosion (*Continued on page 64*)

4. Tubular molded urea light shade used on Kelvinators. 5. Molded phenolics on Servel's cube-compartment include drawer pulls and knobs on tray release levers. 6. Peer Electric Co. makes a battery-operated interior light, switched by door pressure against a wire trigger. Two dry cells are housed in a molded phenolic case. 7. Servel-Electrolux breaker strips, of phenolic laminated, are finished at the corners with molded corner trim pieces, assuring a smooth easily cleaned corner. 8. Frigidaire uses a phenolic molded lamp socket without shade. 9. Push-release type door handles are of molded phenolics. 10. Out of the way yet in the proper place is Frigidaire's thermometer. The bulb is encased in this black molded housing, with dial on the door exterior. 11. Two level shelf supports are ingenious uses of molded plastics. (Photos, courtesy General Plastics, Inc. and Plaskon Co., Inc.)

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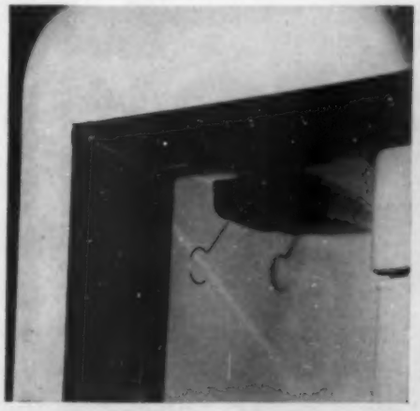

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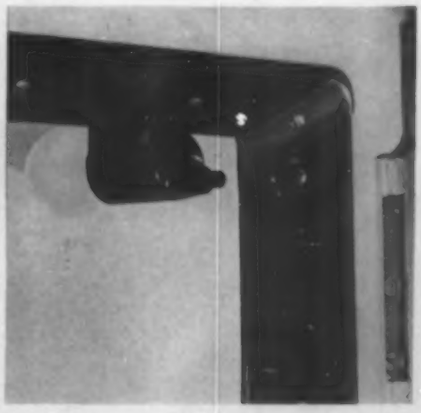

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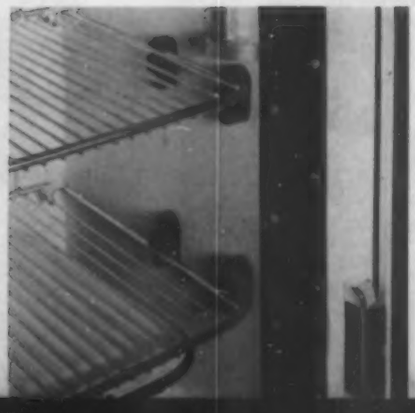

RÖHM & HAAS

C. K. Castaing, sculptor-artist, carves cacti and other designs in the back of these methyl methacrylate trays with such realism that you will actually try to avoid touching the "prickers." The material is one-quarter inch thick, perfectly transparent, used as table decoration, sold by Georg Jensen Hand Made Silver, Inc.

KNOWING WHEN TO REDESIGN

by H. D. PAYNE
Chicago Molded Products Corporation

There is a time beyond which no product should be allowed to build a reputation of being "old fashioned"

"WHEN SHOULD WE REDESIGN OUR PRODUCT? What new features should we incorporate? What is the best way to set about the development of our new design?" These are questions which a good many manufacturers are asking themselves in these days of keen competition—and . . . the future success of the product is likely to depend upon finding a logical, timely answer.

An interesting example of the successful handling of these questions is afforded by the experience of the Burton Manufacturing Company, Inc., in developing their new dental operating light. This firm did not wait to begin the development of a new model until its previous model had become out-of-date and sales had begun to fall off. While this model was still enjoying a position of leadership in its field, they set about to design a still better and more efficient one.

First of all, the company, through its sales department, made a thorough, systematic analysis of dentists' lighting requirements, and the desirable improvements indicated by experience. The findings from this analysis were then presented to their engineering department, with instructions to prepare specifications, along scientific lines, for a light which would as fully as possible meet the requirements indicated. Next, these specifications were given to Barnes & Reinecke, industrial designers, with instructions to collaborate with the Burton engineers in developing a new "Oculite."

The essential features specified were as follows:

1. Appearance and finish to conform to the requirements of the most modernly appointed dental office.
2. Extreme simplicity and ease of adjustment, combined with flexibility to permit the light to be directed to the exact spot.
3. Freedom from glare in the patient's eyes.
4. Maximum light from the minimum current.
5. A means of exactly controlling the light to suit the dentist's visual requirements.
6. Elimination, in so far as possible, of heat radiation.

The need for a rich, lasting, permanent finish, combined with heat insulating qualities, indicated the use of molded plastics for the outer shell, and the various control handles. Phenolic molded was specified, therefore, for the shield, adjusting handle, and current control knob. The permanent black finish of this material forms a striking contrast with the chromium plated light socket, shield, and bracket.

The light itself is mounted on a universal ball joint, with self-compensating, adjustable supporting arm, thus permitting the light to be set instantly in any desired position. The reflector has been so designed as to throw a diffused beam of the oval shape which is most desirable for dental operating purposes. "Alzak" aluminum was specified for this part, because of its light weight and reflecting properties. The direct light of the bulb is shielded and diffused by an oval globe of opal glass, directly over the front of the (*Continued on page 60*)

Views of the Burton Dental Operating Lamp pictured below indicate how completely the fixture was redesigned. New materials gave increased utility in operation as well as more modern form. Molded parts are shown at right

BAKELITE

CASTING RESINS IN RUBBER MOLDS

by JEAN MAYER

A process which holds promise of both speed and economy

PROBABLY A GOOD MANY THOUSAND HOURS have been spent by ambitious experimentalists trying to concoct a molding compound that would approximate the properties of synthetic resins, yet which would not require the high heat and tremendous mechanical or hydraulic pressure commonly used in molding them. There are so many opportunities for molding resins where the weeks required to make a steel or even a cast copper mold constitute a handicap which frequently influences a decision against the use of plastics in favor of some other material which can be turned out more promptly, or with less initial outlay or expense.

There are many times, too, when a manufacturer would like to make only a few items of some plastic material in order to gage his possible market for the item when it is finally ready for quantity production. If he must wait several weeks before a sample mold can be made and a few pieces turned out, the market may change and the potential demand may have passed its most profitable stage. Then, too, if the item is at all complicated in design, the cost of the mold may be more than he would care to gamble to make the test, or more than the test is worth.

It would seem, therefore, that the process of molding or casting resins in rubber molds, which has been worked out by Ralph Mancuso of the Moldite Corporation, may provide a service which will bridge the gap between the well established cast resins which are machined or fabricated from stock shapes, and the equally well established molding compounds which can be formed only in steel or similar molds.

The Moldite process which has been in operation for the past nine months, has both advantages and limitations. To begin with, it requires but a comparatively short while to get into production with any item which adapts itself to the process. Deliveries of finished goods can begin within a few days from the time an original model of the exact size and shape has been made.

The model is first reproduced in a special compound which is capable of being cast in a gelatin mold yet has sufficient strength to resist vulcanizing pressure and is attached to a plate which holds it firmly in place. This plate is placed in a vulcanizing frame and covered with

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sufficient raw rubber to fill the frame when it is placed in a vulcanizing press where it is "cured" or vulcanized with heat in the conventional way. In less than an hour the rubber mold is ready for use. It is tough and flexible and permits the original model to be withdrawn regardless of undercuts or intricacies of design and, since the mold is made of pure rubber, it will stand up under continuous service over a long period of time unless carelessly damaged by the operator who uses it.

Its first advantage, then, is one of economy and speed in making molds. A rubber mold with several cavities costs so little that it can be amortized without serious consideration even on a very small run of production. Making several cavities in a mold requires only that an equal number of original models be cast in the special plaster-like compound and fastened in the vulcanizing frame before the mold is cured.

The next step in the process is to fill the cavities of the molds with a special resin in its liquid stage, then pop the whole business into an oven where it remains for one to two hours in a temperature from 100 to 120 deg. F. This operation is carefully timed and at the exact moment when complete polymerization has taken place the mold is removed and the parts snapped out. Finishing is accomplished by the usual methods.

Once empty, the mold is ready to be filled again. Mold cost is so slight that any number of identical multi-cavity molds can be made for a production run so that a vast quantity of small parts can be turned out in the course of an eight-hour day.

The resin used is a phenol-formaldehyde of the cast resin variety to which a chemical accelerator has been added to promote rapid curing. This is the whole secret of the process and while it is admittedly in the experimental stage the laboratory report (Fig. 6) will indicate that considerable progress has been made in providing a material which is entirely satisfactory for any number of plastics applications, yet equally unsuited to others.

Close tolerances of industrial parts, for example, cannot be successfully maintained nor is the process recommended for such applications. The mere fact that the mold is made of a flexible material would preclude any such expectancy. On the (*Continued on page 62*)

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1. Dog's head paperweight with undercuts behind the ear and on the underside of the nose, which would make it difficult to mold in any other but a flexible mold. 2. Purse handles of ivory cast resin molded in rubber mold. 3. This plaque is 14 in. in diameter with figures in heavy bas-relief. 4. Buttons of unbelievable shapes are readily molded by the Moldite process. 5. Book end reproduced from one originally of bronze simply to illustrate the ease of reproduction

FORMICA 1

Gilbert Rohde, industrial designer, in designing offices for his own use has employed laminated phenolics and ureas where their natural lustrous surfaces will resist wear in continued use. The conference table and cabinet (Fig. 1) have tops of black laminated and arranged above the cabinet are sliding panels of the same material in various colors which can be brought into view when discussing design. It is rumored that the cabinet contains a refrigerated bar and, of course, laminated surfaces are unharmed by alcoholic beverages of any sort.

The reflecting surfaces of black glass create an exaggerated feeling of space in this room as may be seen (Fig. 4) on the opposite page. The compact radio-phonograph (Fig. 2) at the end of the built-in settee has a laminated phenolic top. And hand pulls on the entrance door (Fig. 3) are of transparent cast resin, a dielectric material that prevents electric shocks which frequently occur when touching metal after walking on a carpeted floor. Hotels should employ this idea.

OFFICES OF GILBERT ROHDE

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WHAT IS INDUSTRIAL DESIGN?

(EDITORIAL COMMENT)

I REALIZE THERE IS A WELL ORDERED division of opinion as to just what constitutes modern industrial design and I have no quarrel with any manufacturer who wants to spend his money in any manner he may choose but when I ran across these two illustrations in a contemporary publication and read that the redesign of this motion picture camera was an outstanding accomplishment, I wondered—as others must have wondered—just what is Industrial Design?

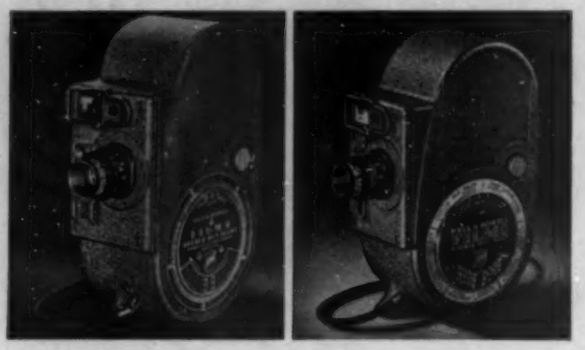
There is no sense in pretending that I am a connoisseur of modern design, but when the Ford Motor Company discontinued its Model "T" and replaced it, first with a better looking car, then later with a car which could stop at a traffic light alongside any automobile of American manufacture without its occupants reflecting the color of the light that stopped them, even I knew that Mr. Ford had come to recognize the public demand for better looking things.

That may be a homely and overworked simile but its parallel can be seen and recognized in many of the things with which we come in contact in our present conveniences of modern life. Transportation has been particularly alert to the advantages of *inviting appearances* in its various conveyances, from the bus with its low cost opportunities for travel to the stream lined trains which have without doubt helped railroads recover much of their lost prestige. Pullman, alone, remains to offer the inconvenience of its upper berths at extra cost. There are rumors that this will soon be changed.

Industrial design as I understand it is more than skin-deep. It is an interpretation, or should be, of the ultimate requirements of the consumer so expressed in the finished product as to give the greatest sense of satisfaction and pride in ownership plus convenience in use. If the finished product does not attain this end, or if the original product possesses these characteristics, why redesign?

There is perhaps no greater blessing in the modern home than mechanical refrigeration. It is a safeguard of our national health through the preservation of food. It's function is one of the greatest conveniences any home can possibly have, yet until a short time ago engineers responsible for the design of mechanical refrigerators insisted on building them *bottom up*. The mechanism was housed in the top where it was convenient for a mechanic to reach when, and if, it needed repairs, but the food storage compartment, which is used dozens of times a day, was placed so close to the floor that women had to get down on their knees to reach the package of butter or to find the head of left-over lettuce which had been pushed to the back.

Intelligent industrial design, has made living much more exciting and pleasant during the past few years. It has played an important part in industrial and commercial recovery. Of that there can be no doubt. But industrial design without intelligence is money thrown away. Money spent for design in which no genuine improvement of the product is made is sheer waste. To every example of good industrial design, there are hundreds of examples of design which are neither useful nor good and this regrettable fact has discouraged many manufacturers, whose judgment and appreciation of design is none too keen, from stepping ahead in their field and deriving its benefits.



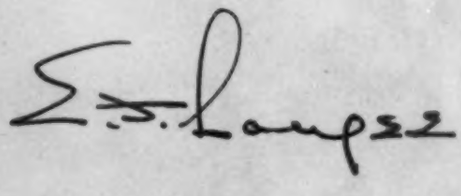
"The value of pleasing, modern design in building sales is afforded by the . . . . . camera shown in the accompanying illustrations," says a contemporary journal

I am not going to comment particularly on the two illustrations which I have reproduced except to quote from the description which accompanied them:

"The original design (of the cameras illustrated) did not give the desired impression of small size. A careful study showed the designers that the impression of size was due primarily to the arrangement of vertical lines on the side panel. As will be seen, these lines covered the entire upper section of the panel, including the small front projection on which the lens is mounted.

"The curved line of the top was extended down the front to join the curved line of the bottom. The straight, vertical lines were confined within the area thus formed. The remainder of the front projection was left without embellishment. At the same time, the vertical lines were made broader and fewer in number, thus causing the area of the panel to appear still smaller."

If the camera was made no lighter in weight or more convenient to use, the design was attempted only to deceive. If adding a line down the side of the case and widening the parallel perpendicular lines is industrial design, then I'm Godiva and I'll meet you at Central Park Sunday morning at ten if I can find a white horse.



OFF THE FIRE—ON THE TABLE

A molded urea tray makes possible the slogan "Off the fire—on the table" adopted by Steelsmiths, Inc., in presenting its new Home Utility Set pictured here. Baking dishes are of polished steel of a quality which an oven or direct flame will not tarnish, and the plastic tray, with its reluctance to transmit heat, is designed to insulate the hot baking dish from the dining table or buffet. Lifting knob on the cover of each dish is cold molded.

PLASKON

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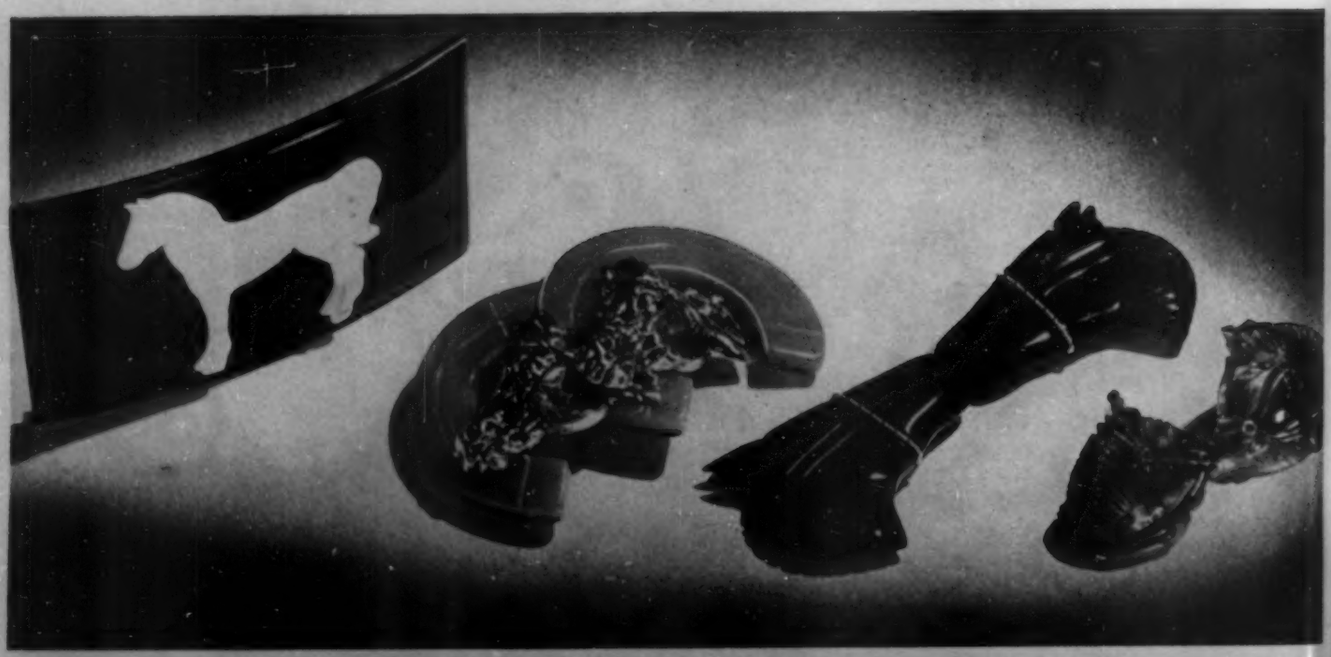

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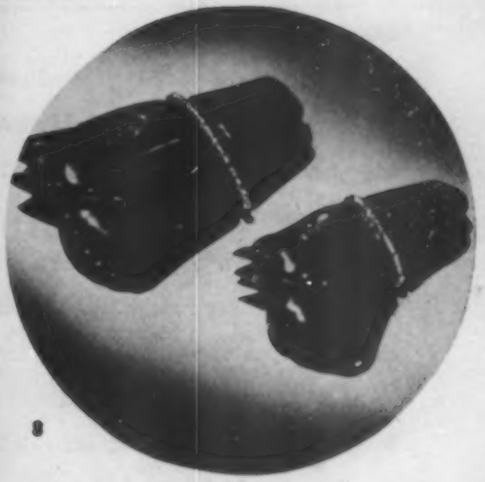

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PLASKON

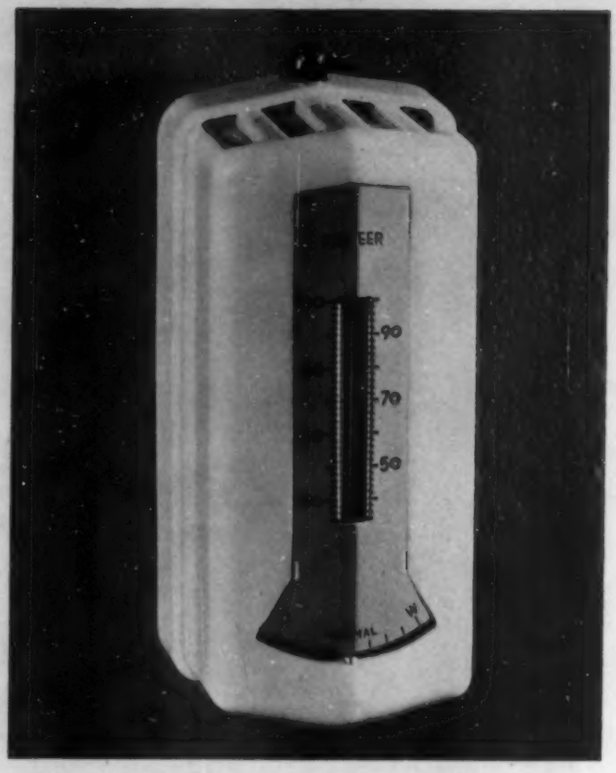
MOLDED COLOR

OBSERVATORY BOX FOR GLASTEX:

Orders for more than 100,000 boxes in New York City alone! Instantaneous acclaim by manufacturers already cashing in on modern packaging's newest idea! Forecasts by package experts that it may well become the display "find" for 1938! This is the case history of the month-old Observatory Box.

The limitless possibilities of combining Molded Color and a transparent plastic into powerful, selling packages, will soon demand your attention. Investigate now. Let us furnish the details and investigate how you may take advantage of this new and striking combination. It costs you nothing and may put extra dollars in your pocket.

The Observatory Box, a product of Glastex Products Company, was an original molding by the Boonton Molding Company.



THERMOSTAT FOR MASTER:

Desiring a modern ivory color for their controls, the Master Electric Company this year adopted Plaskon for the re-designed Pioneer Thermostat. The results:

1. A good, sturdy instrument with a permanently beautiful finish which fits well in any home decoration arrangement.
2. Greater sensitivity of the instrument to room temperature, and complete safety from possible short circuiting due to non-conducting Plaskon base and cover.
3. Enthusiastic reception by all of Master's customers.

SEPTEMBER 1937

DENTAL PACKAGE FOR NEY:

If you are a materials manufacturer and wish to create extra goodwill among your customers, read this letter from Mr. W. P. Conklin, Jr. of the J. M. Ney Company.

"Our products are used largely in the fabrication of dental gold restorations which are made either by the commercial dental laboratory or by the professional man. The Plaskon box provides a

suitable setting in which these beautifully made and finished restorations may be delivered to the dentist by the dental laboratory, and by the dentist to his patient. After distributing 10,000 boxes in six months, we can safely say acceptance has been excellent.

"We chose Plaskon for two reasons: first, because such a container had never been used in this field, and secondly because the color and permanence of the container made it attractive and useful after the original purpose had been served."

METER SCALE FOR BAILEY:

Well over 90% of America's central power stations are equipped with Bailey Boiler Meters to guide operators. Recently, a Plaskon indicating scale replaced the familiar enameled scale. Hand lettering of instructions on the meter was eliminated. Plaskon can be engraved or embossed during the molding operation. The former "defects" became non-existent over night. Best of all, the cost of the Plaskon scale, which is handsomer in every way, is less than the scale it replaces.

PLASKON COMPANY
INCORPORATED

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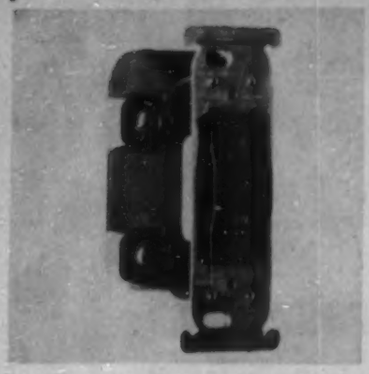

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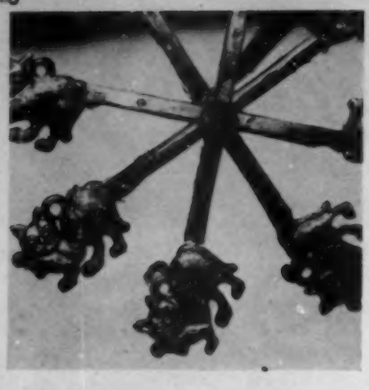

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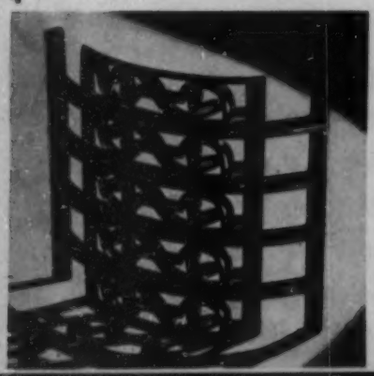

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PLASTICS' PROGRESS

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1. Circuit breakers which serve both as master control switches, governing groups of lighting or convenience outlets and as overload or short-circuit protection are molded of Textolite by General Electric Company. They may be mounted wherever a switch would be placed singly or in gangs

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2. Leudi Light Meter, a tiny device easily carried in a vest pocket indicates the time and aperture settings for your camera under any existing conditions of lighting. The core is molded of phenolic material, the movable sleeve is transparent cellulose. It comes in a molded phenolic box made in Austria, distributed here by Mimosa American Corporation

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3. Tiny black cats to tie around the necks of Boord gin bottles are injection molded of black Tenite. They are made by Northern Industrial Chemical Co. for Distillers Co. Ltd., who use them to identify this particular brand of gin

4. Bakelite molded grille, 9 1/8 in. high and 9 5/8 in. wide used on the Stromberg-Carlson radio has an intricate design which is easily reproduced in a beryllium copper mold manufactured by Gorham Company

5. As a memento of the Coronation ceremonies for King George VI, Bakelite Ltd. distributed this molded "desk tidy" for paper clips and rubber bands. A utility container was molded by the Greet Moulding Company and bears the profiles of the King and Queen

6. Miniature models of its induction polyphase motors, is the Century Electric Company's new form of advertising. The model is identical in contour to the large motors and serves as a satisfactory paper weight. Molded of Bakelite by the Midwest Molding and Manufacturing Company

7. A permanent dispenser molded of Plaskon and Textolite by General Electric Co. is being manufactured in many colors to match bathroom accessories. An acetate refill tube fits into the plastic container preventing seepage or waste. The cap is not removable but can be opened or closed by simple finger pressure. Manufactured by Refillable Paste Tube Ltd. of Canada

8. The job of counting and wrapping coins has been tremendously simplified by Pakoin, a device which consists of a Bakelite funnel and a narrow leather strap. The coin wrapper is held in position for stacking the coins and crimping the ends of the finished roll. Molded by Harry Davies Company

9. This Garod Radio has twin speaker grilles at either end to permit the use of a larger, more legible dial in the front. The cabinet is molded of Durez in two parts by the Waterbury Button Company and a matching back panel is attached to the main housing.

10. Pilot Radio Corp. has produced this new Beetle table model which is molded by Associated Attleboro Manufacturers Inc.

11. Amplicall, which we illustrated in our July issue, has been produced also with a Beetle cabinet to give a wider range of color choice. Any one of ten different connections can be completed by turning the control knob to the proper number. Molded for Webster Company by the Richardson Company

12. A counter display molded of Durez for Ingersoll-Waterbury Company by Norton Laboratories Inc. has recesses for two strap and two pocket watches. These fit under a glass panel and there is a change tray where they are in constant display when the druggist makes change

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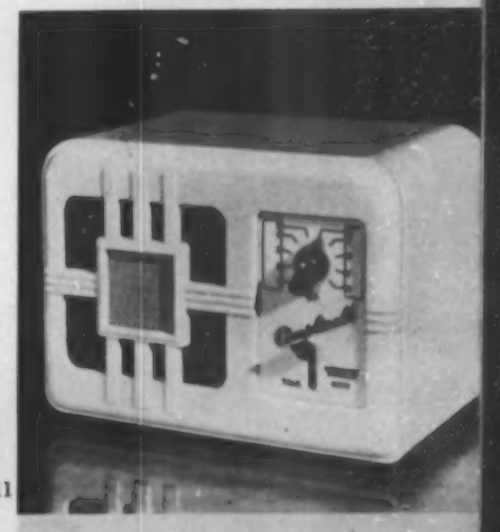

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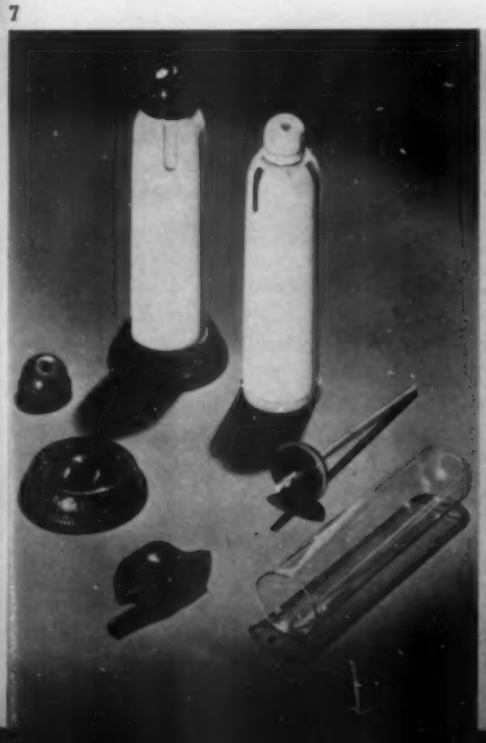

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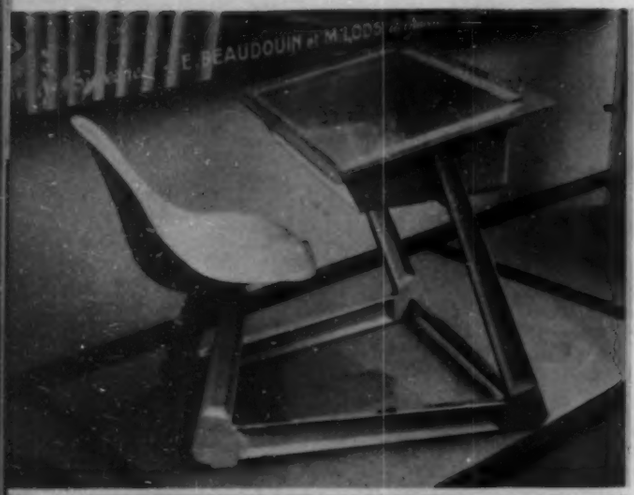
CHILDREN OF FRANCE

may be the first to sit and write on plastics if these experiments succeed



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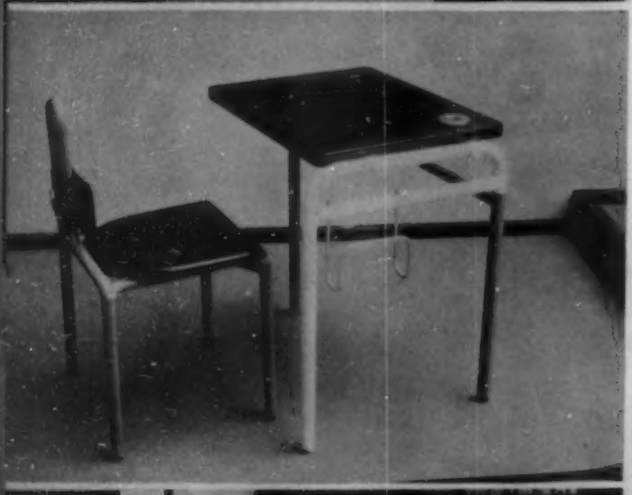

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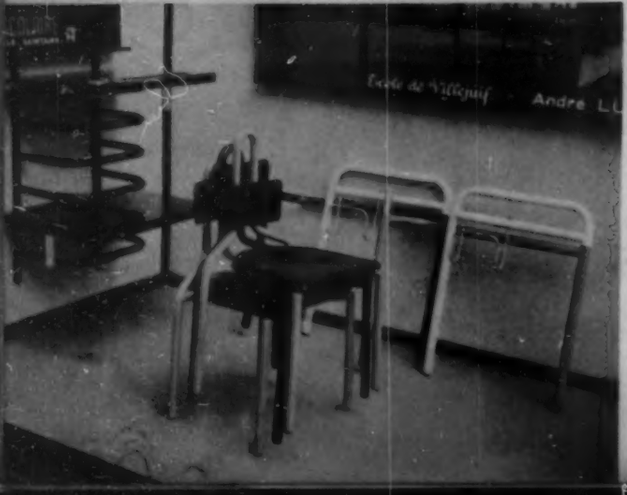

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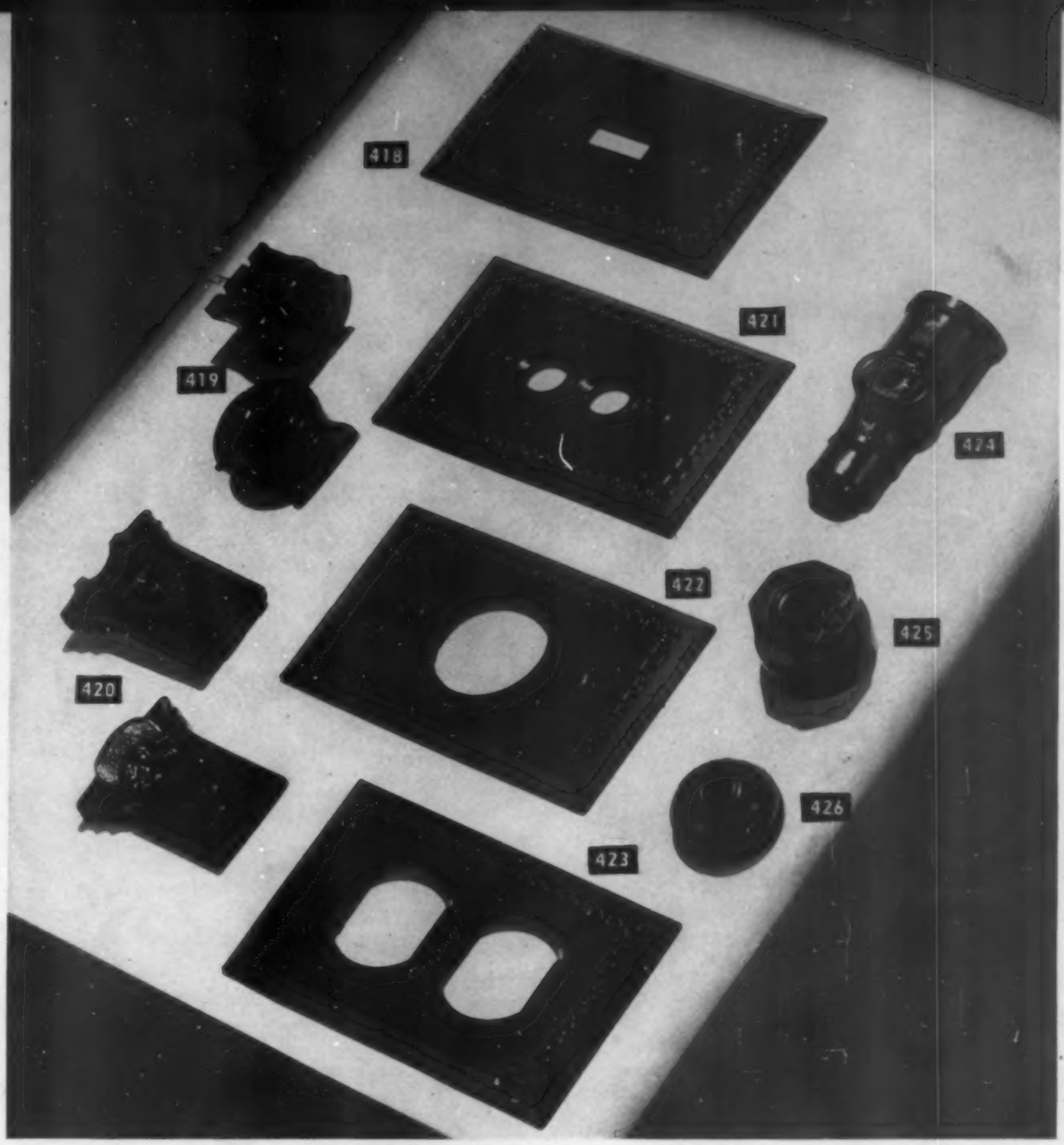
BOTH OPAQUE AND TRANSPARENT PLASTIC materials were shown in a recent exhibit of school furniture at the Salon des Arts Menagers in Paris. And they are reported as being favored over wood because they are a less favorable medium for carrying germs and can be kept clean with comparative ease. Nearly all the designers of this furniture are architects who have consulted with expert physicians upon the design of adjustable backs and seats.

Some of the new school furniture is said to be unnecessarily heavy, showing that it is still in the experimental stage. Other designs, notably those of Barrett, and Charreau, have been designed especially for packing into small space, an advantage when the school room has at times to be used for other purposes.

The desk and chair, designated as Fig. 1, was designed by Jacques Andre and manufactured by Jean Prouve. The back of the chair and top of the desk are of an opaque plastic material, the table being fitted with a wooden rim. Fig. 2 shows an adjustable desk and chair of plastic material on an enameled tubular stand, designed by Barrett and manufactured by Dupre-Perrin.

The desk and chair, numbered 3, are of lacquered metal designed by Beaudouin. The top of the desk has a transparent plastic material which demands an orderly arrangement of the things within. Fig. 4 shows a desk and chair combining plastic material and metal, designed by Charreau and manufactured by Cie Parisienne d'Ameublement, while Fig. 5 illustrates how these desks and chairs may be folded and stowed away.

There are other considerations besides those of sanitation which favor the choice of plastic materials for the manufacture of school furniture. Probably no other desks and chairs in any sort of service are required to withstand the abrasive attack given them by youngsters at this early age. Their resistance to wear makes them a permanent investment. (Photos, courtesy Paris Office du Pont Style News Service.)



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418. Single rocker switch plate 4 1/2 in. by 2 3/4 in. with machined line finish and decorative border

419. Cube taps with decorated sides, either brown or black

420. Heater plugs 2 1/8 in. long

421. Twin push button plate with a machined line finish and designed border

422. Single convenience outlet 4 1/2 in. by 2 3/4 in.

423. Double convenience outlet plate with a panel, machine finished, and a decorative border

424. Current tap with side outlet 3 in. long

425. Attachment plug with decorated top 1 1/8 in. diameter

426. Attachment plug with milled sides and a designed tap 1 1/16 in. in diameter

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Stock molds

SHEET FORTY-TWO

These interesting packaging items which lend themselves to many types of merchandise are available in any quantity without initial mold cost

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347. Beverage tray 10 1/3 in. long and 6 5/8 in. wide. Machined surface to prevent glasses from slipping

348. Cheese dish with repousee cover and decorative handles. 3 1/2 in. in diameter and 1 1/4 in. high. Tray has overall diameter of 6 1/2 inches

482. Cigaret box with lift-off cover and contrasting base and medallion. 4 1/2 in. long, 3 3/16 in. wide, 3/4 in. deep. Overall 1 1/4 inches

483. Cigaret box with lift-off cover 4 1/2 in. long, 3 3/16 in. wide, 1 7/8 in. deep. 2 3/8 in. overall

484. Box with lift-off cover and embossed design. 7 1/2 in. long by 5 3/4 in. wide, 1 1/4 in. deep and 1 3/4 in. overall

485. Hors d'oeuvres serving tray 10 1/2 in. long and 6 5/8 in. wide, with molded decorative handles

512. Small light saccharin container with special spring stop opening which prevents spilling in the pocket or purse yet allows easy removal of pellets. 1 1/8 in. high and 5/8 in. in diameter at mouth

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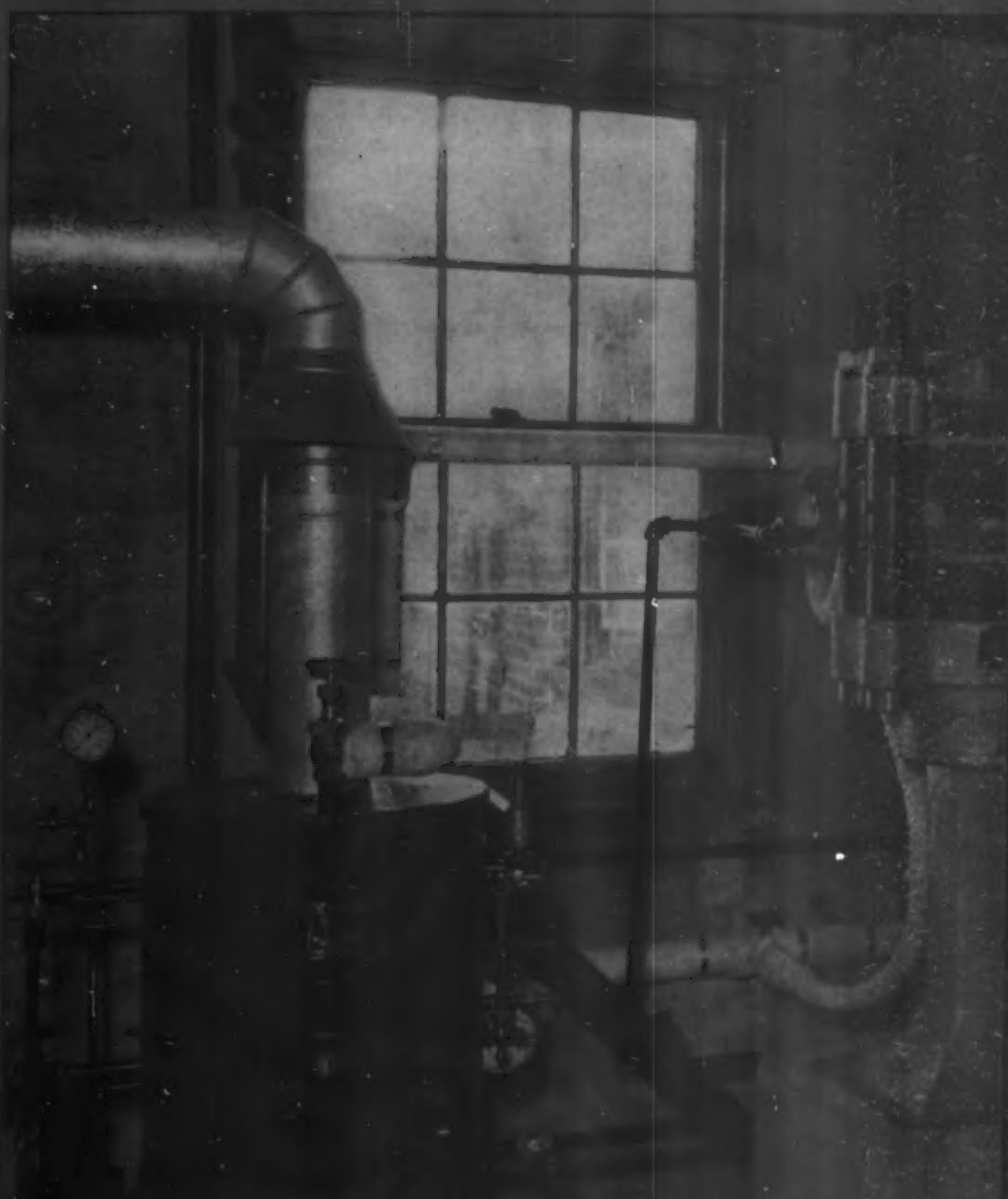
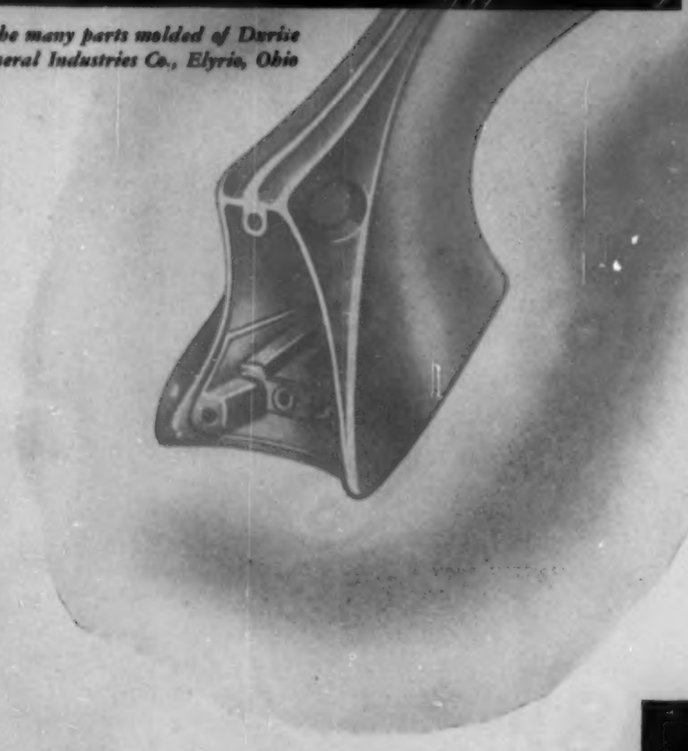
TECHNICAL SECTION

LOW WATER LINE BOILER—SEE ARTICLE PAGE 44



"VERSATILITY"

A few of the many parts molded of Durite by The General Industries Co., Elyria, Ohio



USERS of Durite praise its extreme versatility. They find it can be used today for parts where electrical insulation is the prime problem — tomorrow when the problem may be strength, acid or heat resistance or when its striking finish may be used to give a product added sales appeal. These are but a few of the many qualities which make Durite versatile.

This is one of the reasons Durite has been the specified choice of leading companies for many years. If you have never learned of their advantages, write and ask about these unusual plastics by Durite, the exclusive producers of phenol-furfural resins.

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PLASTICS AT ROCHESTER A. C. S. MEETING

by G. M. KLINE

ABSTRACTS OF PAPERS RELATING TO PLASTICS which were given at the meeting of the American Chemical Society in Rochester, N. Y., during the week of September 6, are presented below.

NATURE AND CONSTITUTION OF SHELLAC. XIV. THE CHEMICAL COMPOSITION OF SHELLAC, by Harold Weinberger, Benjamin B. Schaeffer and Wm. Howlett Gardner. Shellac has been fractionated into several component parts by means of organic solvents. The fractions obtained showed only limited film forming characteristics in contrast to the original material. It would appear that shellac owes its resinous properties to a solid solution of the several components. The composition of four of these fractions has been studied in detail. Two of the fractions appear to contain single components which are intra-esters of the parent acids found in these fractions. Another fraction is a mixture of intra-esters, uncombined parent-acids and coloring matter, and the other fraction is a mixture of free acids and dye. The remaining fractions were very susceptible to polymerization or aggregation, producing insoluble materials which were difficult to analyze. A yield of 21.9 percent aleuritic acid, 20.8 percent lacolic lactone, 4.3 percent kerrolic acid, 1.9 percent of an isomer of aleuritic acid and 0.3 percent of a liquid acid constituent were obtained from the sample of resin analyzed. The last four acids were found in shellac for the first time.

POLYMERIZATION OF METHYL METHACRYLATE IN ORGANIC SOLVENTS, by D. E. Strain. Broadly, polymerization processes fall into three groups: (1) Monomer is polymerized without solvent or diluent; (2) Monomer is dispersed in a non-solvent and polymerized; and (3) Monomer is dissolved in solvents and polymerized. The first method is essentially a casting process while the second is typified by emulsion processes. This paper dealing with methyl methacrylate discusses certain variations in the third method as they affect the rate of polymerization (the amount of resin produced in a given time) and the molecular weight of the resulting polymer. Irrespective of the solvent or the solubility of polymer therein, the rate of polymerization increases and the viscosity (molecular weight) of the polymer decreases with increased temperature and increased catalyst concentration. High monomer concentrations favor rapid polymerization and high molecular weight, while decreasing the monomer concentration gives slower polymerization rates with the formation of lower molecular weight polymer. Similarly as polymerization proceeds and the monomer concentration decreases, the polymerization rate falls off and lower molecular weight polymer is formed. A number of substances affect the rate of polymerization and the molecular weight of the polymer which is formed. This is true not only of inhibitors such as hydroquinone and catalysts such as benzoyl peroxide which need be present in only minute traces to influence the reaction, but also to a lesser extent for the various types of compounds which may be used as solvents during the polymerization reaction. The effect of solvents on molecular weight is illustrated by the following viscosities of polymers obtained without catalyst at 65° C. from 20 percent solutions: water-methanol, 70 (poises for 5 percent resin solution in dioxan); acetone, 1.25; ethylene dichloride, 0.65; benzene, 0.4; butyl acetate, 0.32; dioxan, 0.12. The rate of polymerization in these solvents is in general inversely proportional to the viscosity of polymer obtained.

INFLUENCE OF RESIN CONTENT AND CURE ON THE PROPERTIES OF PHENOLIC LAMINATED PLATE, by O. E. Anderson and E. R. Perry. The effect of resin content and degree of cure on the chemical, physical and electrical properties of laminated plastic was discussed. Three methods for the measurement of the degree of cure were described, namely, acetone extraction, water absorption, and insulation resistance.

CONSISTENCY MEASUREMENT, by E. C. Bingham. The crude methods in use for the measurement of consistencies of various industrial materials are easy to carry out and cheap, but the results, being qualitative only, do not permit rigid adherence to defined standards. The more serious matter is when poorly designed methods do not test a single property but some complex of several fundamental properties, each varying as a function of temperature, pressure and composition. By use of the two point calibration method it is possible to obtain results of the desired precision quickly and with simple apparatus. Asphalt is very stiff with a marked yield value, making the ordinary viscosity measurement meaningless. Other materials, such as paints, clays, greases, etc., are highly thixotropic, and must be studied in various definable states. Still others are chemisetting or thermosetting and the changes taking place are irreversible. Nevertheless, the rheological properties from moment to moment are of the greatest significance. This paper shows how progress is being made in this difficult field.

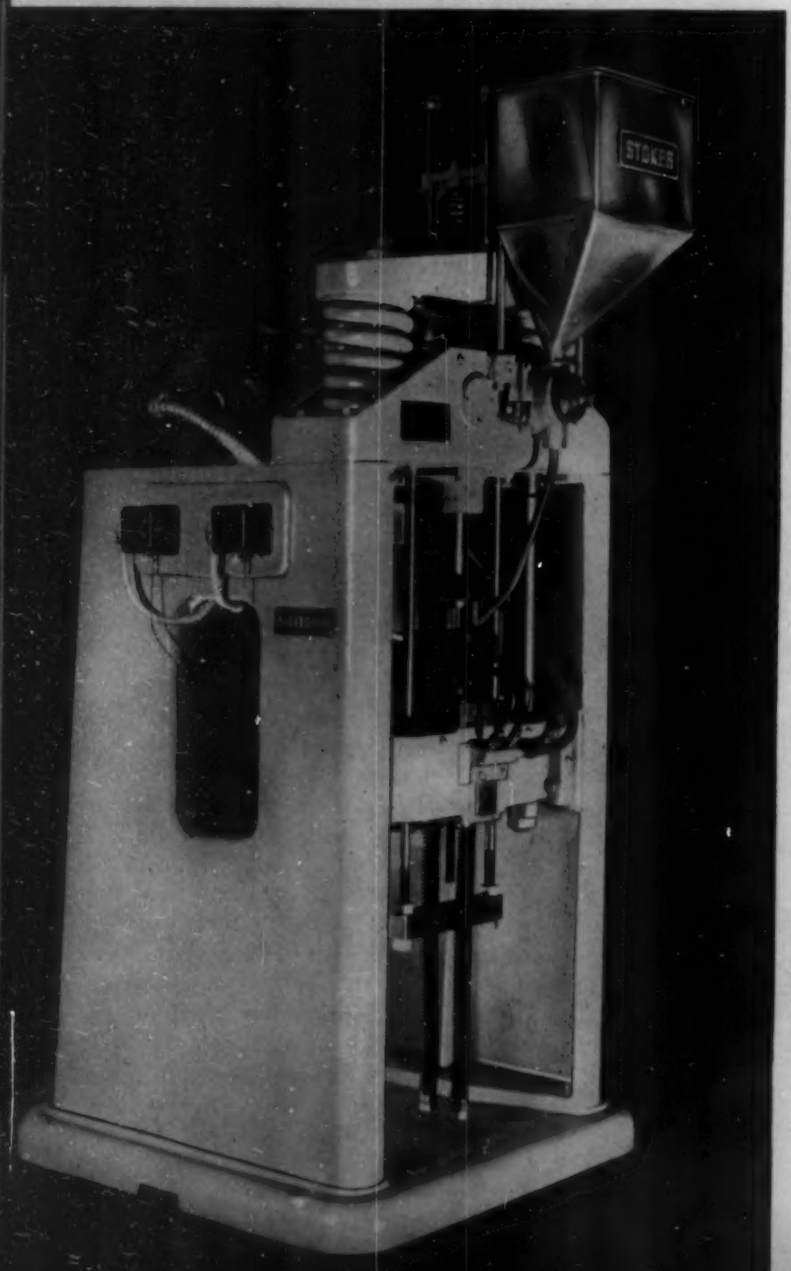
QUALITATIVE DETERMINATION OF GLYCEROL AND ETHYLENE GLYCOL IN DILUTE AQUEOUS SOLUTION, by A. G. Hovey and T. S. Hodgins. A rapid colorimetric test to distinguish glycerol from ethylene glycol is needed, especially now that ethylene glycol is cheap and likely to be present in alkyd resins. Starting with Mulliken's work on the color obtained using pyrogallol with glycerol, various homologs of phenol were tried under both acid and alkaline conditions. Using catechol in an (*Continued on page 58*)

AUTOMATIC MOLDING*—PART I

by VICTOR I. ZELOV
Consultant with F. J. Stokes Machine Company

First of two articles outlining the practical approaches and principles involved in developing an automatic molding press

THE OBVIOUS ADVANTAGES OF AUTOMATIC machinery in general and automatic presses in particular have led to various attempts to apply automatic production principles to the molding of plastics. Until recently, however, these efforts have failed to develop reliable and efficient machinery suitable for use in this field. This was due, partially, to the sequence of operations and the principles involved in the molding of plastics materials and partially to the fact that these efforts have had, as their main objective, the production of simple parts only in tremendous quantities. It was assumed, and naturally, that only in large production would automatic machinery prove economical.



Careful study of the problems involved and much experimenting with apparatus to make automatic production methods available in plastics molding led the writer to conclusions at variance with much of the earlier thinking along these lines, and has resulted in the development of completely automatic equipment that has proved practicable. In this article the approaches to the subject and principles involved are presented.

The basic operations involved in molding are loading the mold, closing the mold, gasing or breathing, curing, opening the mold, ejection of the part, cleaning the mold, introduction of inserts, plus additional operations involved in the molding of more complicated parts.

Cost of the molded parts consists of two factors: (1) Cost of tools or molds and (2) Cost of the part itself, which consists of the material, molding labor, and subsequent trimming or edging operations and overhead.

Whenever quantities are large and cost involved runs to quite a few thousand dollars, a great deal of engineering and development expenses can be assigned to the process of molding some specific article. Molding practices, indicate, however, that there are probably very few—hardly one job out of a thousand—which will run into hundreds of thousands or millions of pieces, and that the great majority of articles are produced in lots of between one thousand to, say, twenty-five hundred or five thousand pieces. The value of such jobs will run into a few hundred dollars only.

Experience also indicates that a great number and variety of articles and parts are not being molded from plastics because of excessive and often prohibitive mold or tool charges. Further, cost of the molded part, the major portion of which is molding labor, depends on the capacity or efficiency of the mold. In many cases, multiple cavity molds are used, not only because of daily production requirements, but to decrease labor cost per piece. For instance—a comparatively simple part, such as an ash tray, which might be ordered in lots of 2,500, would justify only a single cavity mold, yet labor cost per round, or per piece, might amount to anything from two to six cents, while the cost of material might be about one cent or less. In other words, the manufacturing cost of such a tray should be somewhere around six cents, and as the tray has to meet the cost of similar trays, probably produced in much larger quantities from multiple cavity molds, such procedure makes it economically unsound. Therefore, in many instances, unless the quantity involved is sufficiently large, parts which might be required in comparatively small lots

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simply cannot be economically molded, as single cavity molds are excluded because of labor cost and multiple cavity molds are not justified because of mold cost, which cannot be economically prorated into a comparatively small quantity of molded parts.

A single cavity mold, if we disregard the labor cost involved, possesses a great number of advantages over a multiple cavity mold.

(1) Cost of single cavity mold is minimum.
(2) Single cavity mold can be changed or corrected at less cost than any mold incorporating more than one cavity, and any molder has yet to see a new part which, after being molded, could not be improved by some modification apparent only after the mold is constructed and the part molded.
(3) Single cavity can be constructed and completed in a shorter period of time than a mold with more cavities, and the molder is only too familiar with the usual rush and insistence of the customer to produce molded samples and start production as soon as possible.
(4) Molded parts often have to be interchangeable and must be as identical as possible. This requirement is naturally better met in a single cavity mold than in a multiple cavity mold, as the cavities vary somewhat no matter how accurately made.
(5) The most convenient and probably the most superior mold is one of the truly positive type, in which case loading of the mold has to be quite accurate and uniform. It is much easier to place the correct charge into a single cavity mold than into a multiple cavity mold where the measuring means or the cavities themselves might vary to some degree.
(6) Again, excessive loading, resulting in flash, can be practically eliminated, and flash reduced, if a single cavity mold is used. In a multiple cavity mold the charges should take care of the largest cavity, as it is the lesser evil to have excessive flash than a short piece.
(7) Finally, a molded piece from a single cavity mold requires less after molding operations, trimming, and flash removing, than those produced from a multiple cavity mold.

Except for the cost of molding labor the advantages of a single cavity mold are quite evident from many points of view. The automatic press minimizes this labor cost. At the same time, it holds mold cost to the minimum. It possesses all the above-mentioned advantages, except that daily production is limited, as the cycle time, greatly depending on the curing time, cannot be reduced by automatic means. These limitations are inherent with the type of the molding compound and the part itself. Preheating of molding compound, thus shortening curing time, can be conveniently introduced into automatic presses. Of course, the limited daily production can be taken care of by duplicating the units; and with each unit being fully independent, the basic advantages of a single cavity mold are maintained and the performance and operation of each unit is carried on with the same degree of reliability and simplicity.

Quite a variety of parts can be molded with a single cavity mold which would cost less than $100.00. Such mold charges are comparatively low, considerably less than visualized by many who would like to use molded parts, but who, from somewhere, gathered the impression that molded plastic parts are a very expensive luxury not justified unless the demand is assured for quite a large quantity. Therefore, molded parts produced with a small tool investment, and small molding cost, open up a practically unlimited field, allowing the use of these parts for a variety of applications and assemblies and yielding high profits to those who would be able to operate automatic molding presses of proven simplicity and reliability.

Automatic methods, irrespective of the type or capacity of the molds involved, have some inherent advantages over manual or semi-automatic molding. Besides the labor cost, one of the important factors which has to be constantly watched in the plant of a responsible molder is the proper curing time. There is a decided tendency on the part of the molder, whose earnings depend on his output, to shorten the cycle, thus undercuring the part, resulting in inferior properties such as lower insulation, higher water absorption, lower mechanical strength, etc.

If we, therefore, omit few and far between jobs which run into millions, parts such as closures, vacuum tube bases, some electrical parts, etc., we have a tremendous majority of molded work where the cost of the molds is a very important item because it cannot be prorated economically into large quantities of molded parts.

Again, where the whole operation consists basically of loading, closing, gasing, opening of the mold, ejection of the part, blowing out the flash by means of compressed air, etc., mechanical and electrical means can be easily introduced into cycles and sequences adopted into the automatic molding press.

Single cavity, completely automatic presses are at present designed, built, and are in continuous operation with actual experience of one and one-half years showing that uninterrupted operation is dependable and economical. The only attention required is the refilling of the hopper which holds molding compound and the removal of containers in which molded parts are automatically deposited. In other words, a few minutes of daily supervision by an average worker in the molding plant is all that is needed for the continuous operation of an automatic press.

The average time required to re-set the press from one mold to another is from a half-hour to about two hours as, oftentimes, various operations have to be timed, automatic loader adjusted, and temperatures established. Actual experience proves that the investment in such a press is returned within less than one year, cost of a mold is brought to the minimum, and production is started within the shortest possible time. Parts produced are uniform, and incorporating (*Continued on page 62*)

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STEAM FROM SMALL BOILERS

by A. V. LEUDEMANN
Mears, Kane, Ofeldt, Inc.

An experience of comparison between steam from a central source of supply and from individual gas-fired boilers

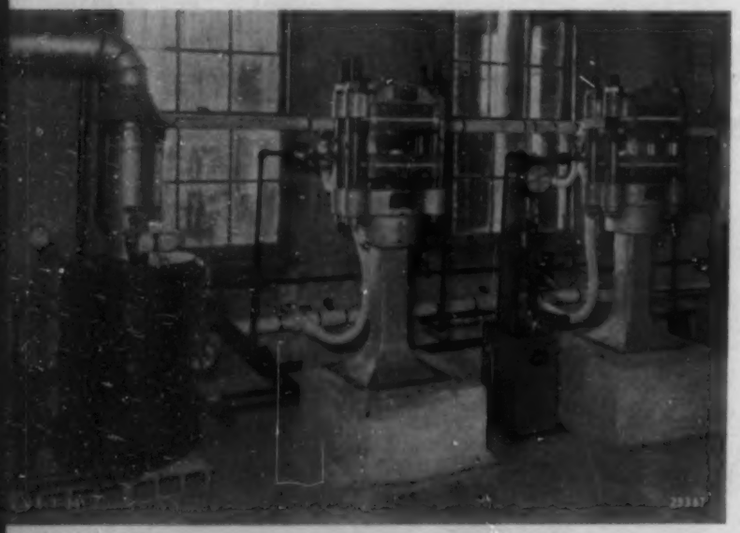
STRANGE TO SAY, IN YEARS GONE BY, VERY little thought was given to the best possible, and most economical method of furnishing heat to platen molding presses. This is probably explained by the fact that a great deal of research work had to be completed in the molding material itself, so as to meet the demand of continuous changes in designs, finishes and production methods of this ever-increasing popular product.

Knowing the temperature requirements of the molding die, it was considered a simple problem to furnish steam at the proper pressure to attain such temperatures. Whether or not boiler installations were designed for high overall efficiency, or arranged to furnish maximum flexibility in steam pressure requirements, was not considered a part of the general molding problem. Steam-heated platen presses were frequently attached to existing high pressure steam lines, and in many instances, all of the condensate wasted.

As popular demand for molded plastics increased, smaller manufacturers entered the field. In most cases, these concerns had no steam generating equipment at all; in fact, no means of obtaining high pressure steam, without the installation of their own boiler plant.

For many years, the generally conceded methods of furnishing steam at proper pressure to a battery of molding presses was to install one or more boilers, and arrange the installation so that as complete automatic operation as possible could be obtained. In most cases, such installations required long runs of high pressure steam lines; pressure reducing valves to each press; steam traps, and return lines as well as electric connections on and about the boiler feeding equipment, in order to assure the return of all hot condensate coming from the presses. When operating at steam pressures between 130 and 180 lbs. gage pressure, the return of such hot condensate to the boiler presented innumerable problems—the major one being the overheating of the water in the receiver tank—resulting in faulty pump operation, and frequent failures in the water feeding equipment. In some instances, cooling coils and flash tanks were installed, so as to condense the steam in the return lines from the presses, and to lower the temperature of the returning condensate, so that boiler feed pumps were able to force this hot water into the boiler as feed water. The cooling of condensate results in loss of heat in the operating cycle and, in turn, increases the amount of fuel burned—lowering the operating efficiency.

Realizing that the primary consideration was to furnish steam at high temperature to the platens of the presses, and that the steam generating equipment should be such that changes in steam pressure could readily be made to meet the changes in molding temperature requirement, it became apparent that steam and return piping, as well as reducing valves, traps and pumps were only a means of attaining such correct molding temperatures. Most large manufacturers of plastic products had



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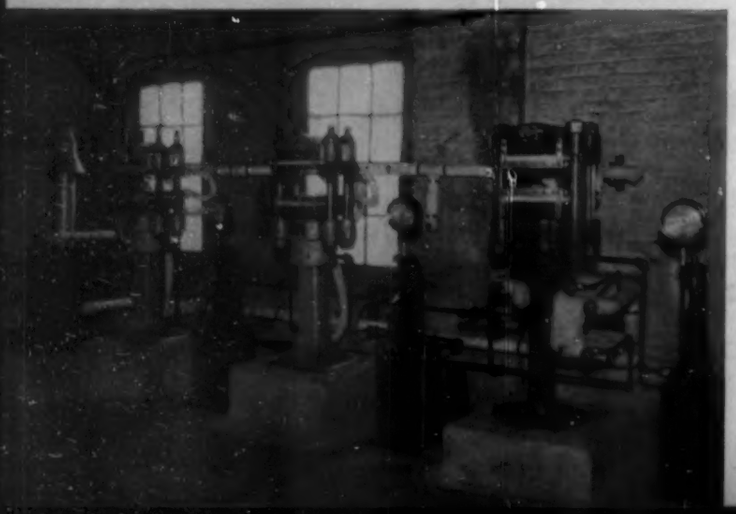

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1. Low water line boiler, directly applied to two or more small platen presses, with direct returns brought back to the boiler by gravity. Boiler equipped with hand injector for emergency feed. Operating pressure, 140 lbs. 2. The same installation as Fig. 1, showing a general view of the platen presses with the same boiler. These are all Watson-Stillman presses

already made the investment in central boiler plants and, therefore, the opportunity of demonstrating the economy in operation with small boilers had not presented itself. However, installations of small boilers, attached to one or two molding presses, had been made in smaller plants, so that definite information was available as to boiler and press performance, but no comparative cost data of the central plant compared to the individual boilers.

Early last year, the opportunity of making such a comparison presented itself. A manufacturer located in New Jersey, and using 16 molding presses with steam from a central boiler plant, comprising two large boilers, was in need of an additional press. The capacity of the boiler plant was such, that the addition of another press might overload the boiler and result in a reduction of steam pressure on the 16 original presses. It was, therefore, decided to place a small boiler on the one additional press only.

The central boilers of this plant were located in a room adjacent to the press room; the usual high pressure supply and return lines, as well as reducing valves for each press, with traps, receiver tanks, pumps, etc., were being used.

The additional press was placed in the same line with existing presses, so that production schedules were maintained. A 1-HP gas-fired boiler was installed alongside this press, with as short steam and return connections as possible. Flexible connections in the steam and return lines were made of coiled copper tubing, to allow sufficient movement for opening and closing the press. With the low water line type of boiler, the returns from the platens were made directly to the boiler by gravity—no traps being required. The automatic steam pressure regulator of the boiler governed the flow of gas to the burner in proportion to the amount of steam used. Being adjustable for any pressure, this device also served as a positive means of governing the temperature of the platens, and no additional reducing valves or regulators were required. During the entire testing period, the temperature of the platen did not vary over 5 degrees.

With all steam and return connections tight, the water losses in the boiler were very slight. Hence, no provisions for automatic replenishing of water to the boiler was necessary. Occasionally, perhaps once in 24 hours, a small quantity of make-up water was added.

The test was extended over a period of three months. Separate records were kept of the daily gas consumption and production hours of the press, and similar records kept for the remaining presses supplied with steam from the central boiler plant.

Theoretically, from a performance standpoint, the two systems should be about equal when running at capacity; the slightly lower efficiency of the small unit being offset by the piping and return temperature losses inherent in the larger set-up. The data gathered during the first 15 days of the test when all details of production and press hours were available, show this theory to be largely correct.

The small boiler had a rated input of 90 cu. ft. of 525 B.t.u. gas for an output of 1-HP; the central plant, 85

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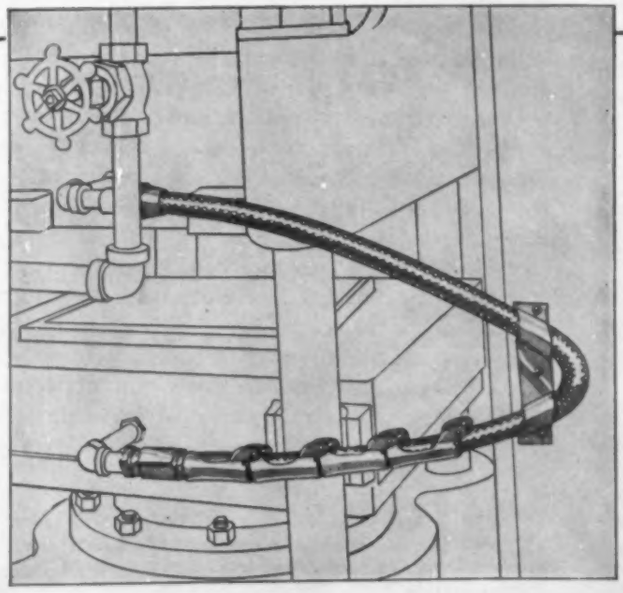

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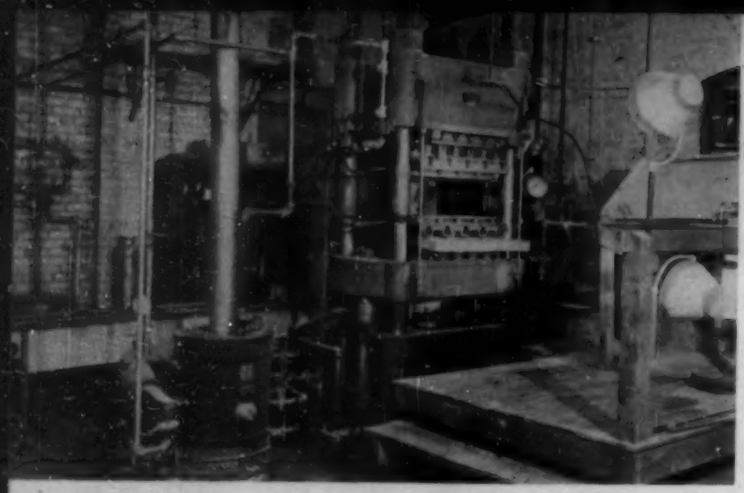
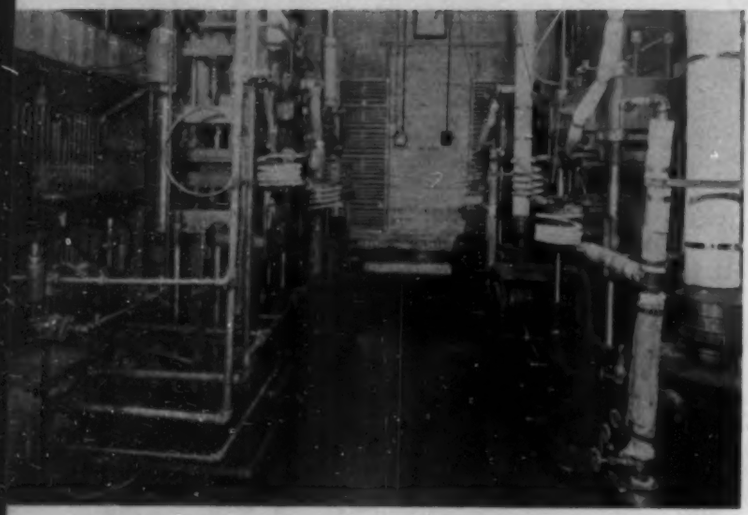
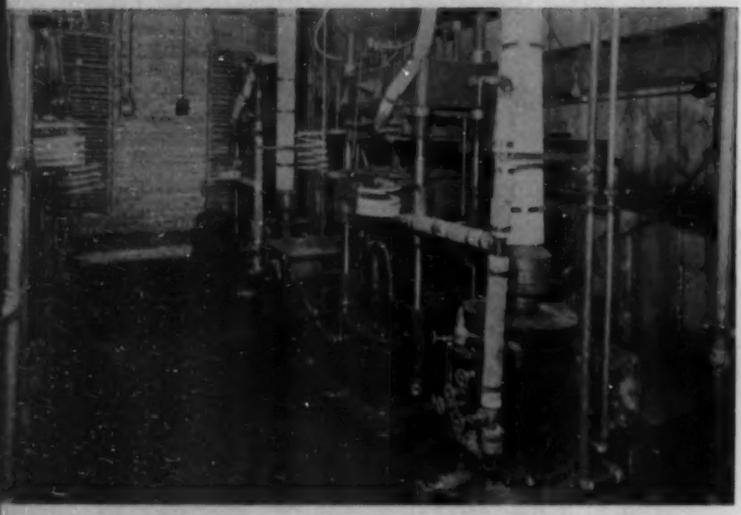
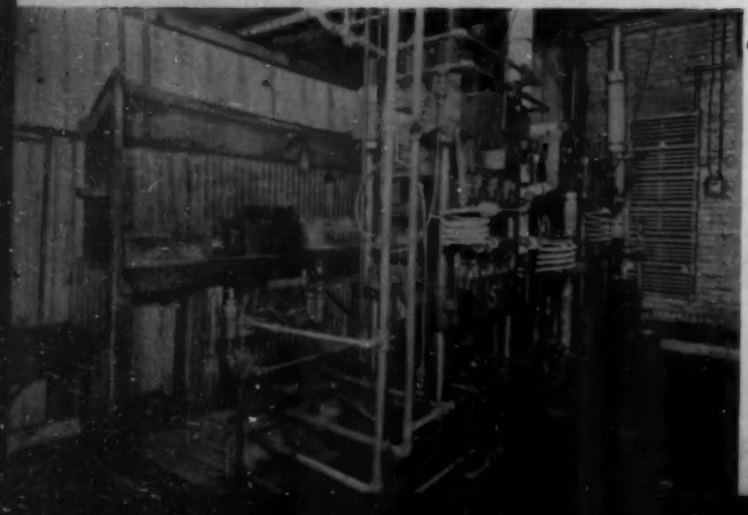








cu. ft. per horsepower. In both instances the connected load was approximately 1-HP per press. Under peak operating conditions, the actual consumption was 91.7 cu. ft. of gas per press hour for the small boiler and 87.8 cu. ft for the large. During this period the small boiler press unit operated each day for the full 24 hours, while the load on the larger boiler varied frequently due to presses being out of service.

Experience permits us to assume that these conditions can be fairly considered as normal, and that the comparisons they afford are reliable for future reference. The fuel consumption for the small boiler did not vary for any 24-hour period during the 15 days of continuous operation, neither was any maintenance attention necessary. This also applied for the full three months during which it was under test.

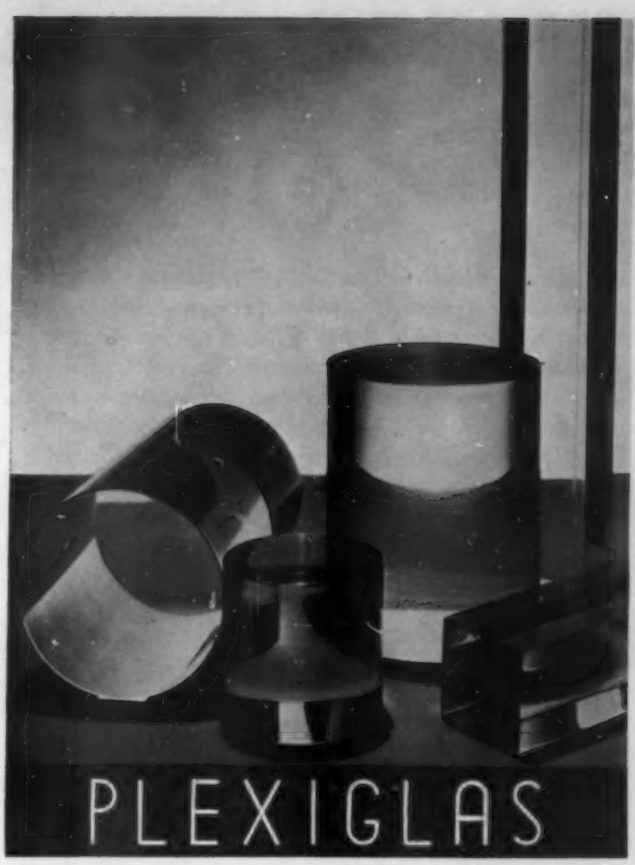
On the other hand, with the large central boiler installation the average consumption per press varied from 87.8 cu. ft. of gas per hour on a maximum production day when a total of 360 press hours were used, as against 105.8 cu. ft. per press hour when only some of the presses were in use for a total of 274 press hours; or, to put it another way, 20.5 percent increase in a unit cost per press hour, with a 23 percent decrease in production.

As was expected, the hourly gas consumption on the single press, using its independent boiler, varied but slightly over the entire period of the test, with the exception that when the dies were changed it was necessary to shut off the steam from the press in order to cool it, and, therefore, the gas consumption for reheating exceeded the average hourly consumption, which was readily understood. All of these presses were of the straight heating type, as the product manufactured did not necessitate heating and chilling in the same press. The results obtained would indicate that from an operating standpoint it would be desirable to apply single boilers attached to each press (or one slightly larger boiler for two presses)—mainly for the reason that steam pressures would not vary as more or fewer presses were put into service. In the plastic molding industry it frequently becomes necessary to operate different presses at different steam pressures. With the individual boiler application, this is easily accomplished, since one press is not dependent on the other—steam pressures being controlled by a regulator attached to each boiler.

It might be considered more expensive to apply individual boilers to presses, but this is not all together true—even though the cost in boilers will be higher. There being no necessity for long runs of steam and return piping, and certainly no need for steam pressure

(Continued on page 60)

3. 3-H.P. low water line boiler connected to a Dunning & Boschert press, with direct feed and return connections. Injector also used for emergency make-up water feed. Operating pressure, 180 lbs. 4. A group of four platen presses, each heated with its own individual 2-H.P. boiler, with direct return connections. 5. An angle view of the same installation showing the boiler applications. 6. The opposite row of the same installation showing two presses



Due to its perfect, flawless transparency and its outstanding light stability, this colorless acrylic resin is finding wide use in the optical industry. Lenses, both molded and ground, magnifiers, and watch crystals are a few of the articles now fabricated from Plexiglas.

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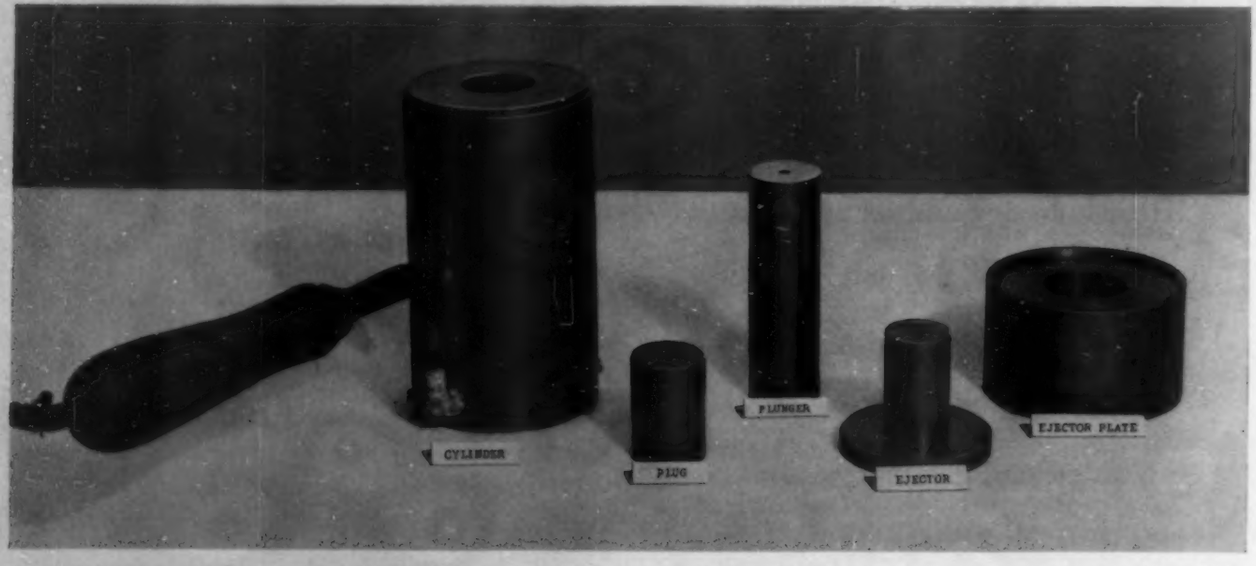
PLASTIC MOUNTS FOR PLATED SPECIMENS

by HERBERT CHASE

MEASUREMENT OF THE THICKNESS OF COATings plated on metal are required not only in research work but in checking numerous plated samples to make sure that the thickness of coating meets required specifications. Such measurements are important because the life of plated coatings and the degree of protection they afford is generally in direct proportion to the thickness of the coating, other conditions being the same. An accurate and much used method of measuring the thickness of such coatings is to cut through the sample at right angles to the plate, then polish and etch the surface cut and subject this surface to microscopic examination during which the measurement is made. The microscope is needed because the coating is often only a fraction of a thousandth of an inch thick and because it is necessary clearly to reveal the boundary of the deposit at its periphery if an accurate measurement is to be determined.

If, in grinding the surface to be examined, the edge of the specimen be rounded, it is difficult or impossible to make an accurate measurement of the thickness sought. For this reason, it is common practice to mount the specimen securely in a matrix which will extend beyond the edge and support it. Metal alloys of low melting point are sometimes used for this matrix but such alloys usually contain cadmium which is a highly undesirable impurity in zinc die castings. Millions of these castings are plated for automotive and other use and if a single mount containing cadmium should find its way into metal being melted for such die castings it may render the batch of metal unfit for use. Alloys of higher melting point may affect the plating to be measured, hence other mounting materials have been sought.

As in other instances where metals present disadvantages, plastics have provided a highly acceptable solution. Clear phenolic and acrylate resins are plastics which have been tried with *(Continued on page 58)*



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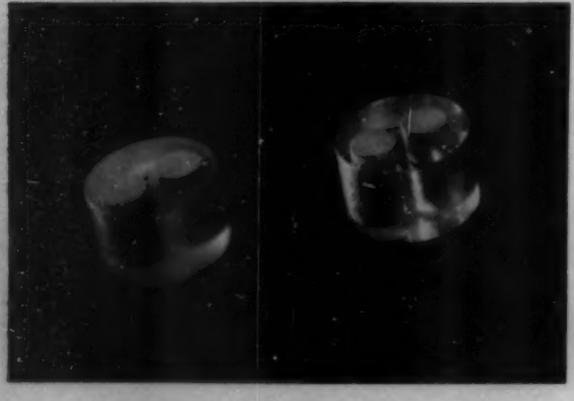

2

1. Simple and inexpensive molding (and ejector) equipment employed for molding the plastic matrix around specimens to be mounted. The cylindrical mold has an electric heating unit inside the jacket 2. Bakelite and Lucite mounts containing specimens of zinc alloy on which the plated coating thickness is measured by microscopic means after polishing and etching

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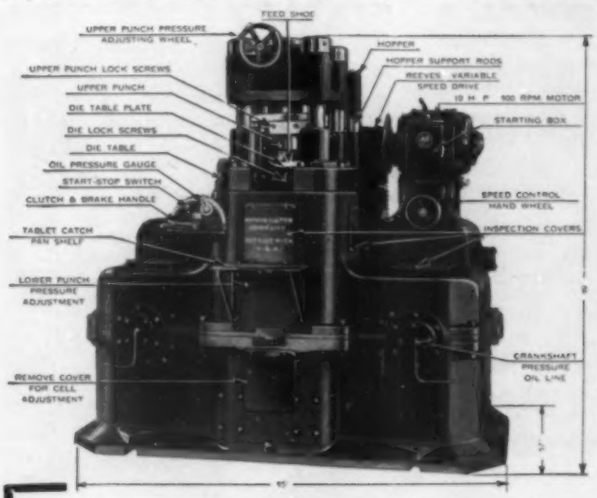

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PLASTICS DIGEST

This digest includes each month the more important articles (wherever published) which are of interest to those who make plastic materials or use them

General

DYNAMIC SYMMETRY IN RADIO DESIGN. W. C. Eddy. Radio Engineering *17*, 5–6, 29 (June 1937). Dynamic symmetry is a science of design based on principles of good proportion. If we start with unity and add in sequence, we produce a progression or summation of the order 1:2:3:5:8:13:21:34:55:89:etc. This is "nature's design," to be found throughout myriad forms of animal and plant life. Thus, the intersecting spirals of seeds in a sunflower pod always maintain a mathematical relation to each other, i.e., if there are 21 seeds in the short spiral, there are 34 in the long spiral. If the short spiral contains 55 seeds, the long spiral has 89. The application of this sequence to geometric design is described and illustrated by various radio parts on the market, including various moldings. The article is not complete in the June issue.

SPECIFICATIONS MADE TO ORDER. PIONEERING IN A NEW PLASTIC OF DEFINITE PREDETERMINED PROPERTIES. A. E. Pitcher. Chemical Industries *41*, 125–8 (Aug. 1937). Development work on a methyl methacrylate resin to serve as a substitute for quartz in appliances used for pathological examinations is described. The resin will transmit about 75 percent of ultraviolet rays used for the treatment of diseases compared with 100 percent transmission by rock crystal. The methacrylate resin has substantially the same refractive and light transmitting qualities as the rock crystal. The resin is stronger, lighter, more easily worked, and is considerably less expensive than the rock crystal.

POLAROID FILMS. H. Freundlich. Chem. and Ind. (London) *56*, 698–9 (July 31, 1937). The historical background of the study of polarization of light by dichroic crystals is presented. In Polaroid the herapathite crystals are oriented by letting the cellulose nitrate or acetate extrude through a slit-like die, and then letting it set and harden. Some difficulty due to the retardation of flow in the outer layers of the mass disturbing the regular distributions of the particles was avoided by extruding the desired material between two layers of plastic mass containing no herapathite.

NEW DEVELOPMENTS IN THE PLASTIC INDUSTRY. A. F. Randolph. Chem. and Met. Eng. *44*, 427–9 (Aug. 1937). A compilation of trade names of plastics produced in America and Europe, supplementing the list which appeared in the November 1934 issue of this same journal. To be completed in the September issue.

GENERAL PROPERTIES OF CELLULOSE DERIVATIVES. René Bluma. Rev. Gén. Mat. Plastiques *13*, 187–93 (June 1937). A review of the constitution, methods of analysis, and uses of cellulose, and the preparation, analysis, and effect of solvents and plasticizers on the properties of cellulose nitrate, cellulose acetate, ethylcellulose and benzylcellulose. Not complete in this one issue.

Materials and manufacture

PLASTIC MATERIALS FROM RUBBER AND TAR PRODUCTS. G. T. Morgan and D. D. Pratt. Chem. Age (London) *38*, 117–9 (Aug. 7, 1937). Experiments on plastics made by mixing natural rubber and chlorinated rubber with high and low temperature tar oils are described. The utilization of vulcanized and chlorinated rubbers as fillers for phenol-formaldehyde resin molding compositions is also considered.

DECOMPOSITION OF CELLULOSE XANTHATE BY WATER IN THE MANUFACTURE OF TRANSPARENT FOIL. I. Sokolow. Rev. Gén. Mat. Plastique *13*, 199–201 (June 1937). A discussion of various factors involved in the manufacture of regenerated cellulose foil using water as the precipitating agent. An improvement in quality as well as lower cost is claimed.

EXTRACTION OF HARD LAC RESIN BY MEANS OF AQUEOUS SOLUTIONS. R. Battacharya. Chem. and Ind. (London) *56*, 666 (July 17, 1937). Aqueous solutions of alkali phosphate, borax and sodium carbonate have been used successfully to extract lac resin, stirring the mixture well at 80–100° C. for one hour or longer. The amount of soft resin extracted depends upon the alkali concentration.

STYRENE AND ACRYLIC RESINS. A. Renfrew and A. Caress. Chem. and Ind. (London) *56*, 682–4 (July 24, 1937). A review.

AMINOPLASTICS. P. K. Chance. Chem. and Ind. (London) *56*, 639–41 (July 10, 1937). The uses of urea-formaldehyde resins in molding powders, as a filler for textiles, a constituent of lacquers, a base for cement or glue, and in the manufacture of laminated sheet, are considered.

THE PRODUCTION OF PLASTICS MATERIALS. Harry Barron. India-Rubber J. *93*, 551–2, 584, 586, 679–80 (1937). The preparation and properties of the urea-formaldehyde and glyptal resins and cellulose plastics are described. Ibid *94*, 47–8, 55 (July 10, 1937); The styrene, vinyl and acrylic ester resins are discussed.

CHLORINATED DIPHENYL. G. R. Eyssen. Plastics (London) *1*, 112–3 (Aug. 1937). A survey of the physical properties and uses of this group of resins.

CATALYSTS IN THE PREPARATION OF VINYL ESTERS. M. Jeanny. Rev. Gén. Mat. Plastiques *13*, 203–5 (June 1937). The catalysts used in the reaction of gaseous acetylene in contact with a liquid medium containing the acid and the catalyst are the salts of mercury either alone or in combination with other reagents, and the salts of zinc and of cadmium. The various patents relating to this reaction are reviewed. Not complete in the one issue.

Molds and molding

ELECTRIC HEAT BOOSTS PRESS PRODUCTION OF BAKELITE INSULATION. Anon. Electrical World *108*, 76 (July 3, 1937). Nine hydraulic presses in the molding plant of the W. M. Gulliksen Mfg. Co. are equipped with 220 volt cartridge type heating units which have replaced steam cells. Six 1000 watt units, divided equally between upper and lower plates of the presses, maintain a temperature of 350° F.

FORD PROCESSES 15,000 POUNDS OF PLASTICS DAILY FOR AUTO PARTS. Herbert Chase. Steel *100*, 42–5 (June 21, 1937). Cf. British Plastics *9*, 84–6 (July 1937). Approximately 3,000 pounds of soy bean plastic is being made in the Ford pilot plant daily. This material is used for coil cases, bases for same, and gear shift knobs. The molding of window frames of this material has been discontinued because of breakage during assembly. Experiments with a more flexible composition prepared with benzylcellulose are in progress. Phenolic and urea resins and cellulose acetate composition are used daily in the main molding department in which 60 presses are employed, many of them of 300-ton capacity.

PLASTIC MOLDING REQUIRES SOUND ENGINEERING PRACTICE. Anon. Iron Age *139*, 36–9 (June 24, 1937). A descriptive account of production of molded parts in the plant of Chicago Molded Products Corp.

Applications

SYNTHETIC RESINS AND THEIR APPLICATIONS AS TEXTILE FINISHES. D. H. Powers. Am. Dyestuff Reporter *26*, 397–404 (July 12, 1937). The author describes the various types of synthetic resins that are used to treat fabrics and the effects that are obtained depending upon whether the resin is on the fiber, between the fibers, or in the fiber. The resins may contribute the following properties to fabrics: increase in strength and weight, apparent bulkiness, surface luster and glaze, waterproofing, and decrease in shrinkage and slippage. The cost factor and difficulties involved in application of the resins are discussed.

MOLDED PLASTIC LENSES. R. D. Potter. Science *85*, sup. 12 (June 4, 1937). A brief account of the possibilities of this application of methyl methacrylate resin.

PLASTIC MATERIALS FOR AIRCRAFT CONSTRUCTION. N. A. de Bruyne. J. Royal Aero. Soc. *41*, 523–590 (July 1937). A detailed presentation of the author's experimental work on the preparation of a cord-filled phenol-formaldehyde resin composition for use in structural members of airplanes.

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U. S. plastics patents

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GLOSS COATING. Robert T. Hucks (to E. I. du Pont de Nemours and Co.). U. S. 2,086,714, July 13. A greaseproof high gloss enamel comprising a cellulose derivative lacquer, blended with an alkyd resin and pigmented with zinc oxide.

OPTICAL SCREEN. Wm. H. Moss (to Celanese Corp. of America). U. S. 2,086,729, July 13. Making a projection screen of rayon, having its interstices filled with a vinyl resin composition.

GREASEPROOF PAPER. Carleton Ellis (to Ellis-Foster Co.). U. S. 2,086,903, July 13. Greaseproofing wrapping papers by coating or impregnating with an alkyd resin containing a higher fatty acid in chemical combination.

SAFETY GLASS. Otto Hauffe (to Deutsche Celluloid-Fabrik). U. S. 2,087,090, July 13. Making safety glass by coating glass plates with an aqueous dispersion of a vinyl resin or a mixed interpolymerized vinyl chloride and acrylic acid resin, drying, and cementing together the coated sides of two such glass plates.

METAL FINISH. John D. McBurney and E. H. Nollau (to E. I. du Pont de Nemours and Co.). U. S. 2,087,094, July 13. Producing a high metal luster on rigid surfaces by means of a tung oil, linseed oil and alkyd resin baking varnish which is dusted with aluminum powder before it is entirely dry, buffed to a mirror finish, baked 45 seconds at about 226° F. and finally coated with a clear protective coating.

RESIN. Moyer M. Safford (to General Electric Co.). U. S. 2,087,096, July 13. An oilproof, flexible, elastic, plastic resin which can be shaped by extrusion is made by blending 60–80% by weight of a cured, and 20–40% by weight of an uncured flexible comminuted alkyd resin.

ABRASIVE. Carl W. Foss (to Carborundum Co.). U. S. 2,087,318, July 20. A flexible abrasive sheet has a cellulosic foil for its backing, with a synthetic resin impregnated fabric cemented thereto to form a relatively rigid but brittle sheet, and abrasive grains cemented to the fabric layer.

BLEACHING RESINS. Chas. A. Thomas and Wm. H. Carmody (to Monsanto Chemical Co.). U. S. 2,087,457, July 20. Bleaching a polymerized coumarone-indene resin, without sacrificing its merits as a varnish resin, by treatment with a decolorizing clay in naphtha solution.

VARNISH RESIN. Wm. Chalmers (to Röhm and Haas Co.). U. S. 2,087,468 and 2,087,469, July 20. Polymerizing a mixture of the nitrile and the lower aliphatic esters of methacrylic acid in presence of a compound which yields oxygen; and making a varnish from the resulting resin.

CELLULOSE ETHERS. D. H. Powers, L. H. Bock and A. L. Houk (to Röhm and Haas Co.). U. S. 2,087,549, July 20. Etherifying cellulose in a solution made alkaline by a quaternary ammonium hydroxide.

PAVING BINDER. Ernst Bürgin (to I. G. Farbenindustrie Aktiengesellschaft). U. S. 2,087,614, July 20. Use of a small proportion of chlorinated polyvinyl chloride in tar binders for paving compositions.

VARNISH RESINS. Carleton Ellis (to Ellis-Foster Co.). U. S. 2,087,852 and 2,087,853, July 20. Making a resin from glycerol and an aromatic carboxylic acid having no ring structure other than that to which the carboxyl group is directly attached; and making a drying oil modified phenolic resin by condensing xylenol with a ketone and an aldehyde in a drying oil.

CHEWING GUM. Wm. H. Carmody (to Neville Co.). U. S. 2,087,900, July 27. As a chewing gum base, a tasteless and colorless hydrogenated coumarone-indene resin.

CORK COMPOSITION. Wm. M. West (to Crown Cork and Seal Co.). U. S. 2,087,942, July 27. Making a cork composition of granulated cork and a binder containing a resin, bodied tung oil and polymerized chlorobutadiene.

RESIN VARNISH. S. L. M. Saunders. U. S. 2,088,035 and 2,088,036, July 27. Making an oil-soluble resin by dissolving a fusible phenol-formaldehyde resin in a fatty acid monoglyceride, then adding phthalic anhydride and heating to form a modified alkyd resin; and making an air-drying varnish by dissolving monomethylolurea in an alcohol solution of formaldehyde with hydrochloric acid as condensation catalyst, the solution being then heated to effect the condensation.

NONCHALKING LACQUER. Geo. R. Ensminger (to E. I. du Pont de Nemours and Co.). U. S. 2,088,052, July 27. A nonchalking, nonbronzing cellulose lacquer contains a resin formed by interpolymerization of vinyl chloride and a lower aliphatic vinyl ester; it is pigmented with a pigment not ordinarily free from chalking or bronzing.

CREASEPROOF FABRICS. A. E. Battye, John T. Marsh, Jos. Tankard, Wm. H. Watson and F. C. Wood (to Tootal Broadhurst Lee Co.). U. S. 2,088,227, July 27. Creaseproofing fabrics by impregnating with methylolurea and a potentially acid ammonium salt, and heating to insolubilize the resin.

ALKYD RESIN. Israel Rosenblum. U. S. 2,088,612, Aug. 3. Making oil-soluble resins by heating glycerol with a volatile aliphatic acid (not higher than valeric acid) and condensing the product with a polycarboxylic aliphatic acid and an acid liberated from an oil, fat or wax, then heating till the volatile aliphatic acid is vaporized.

FOILS. Henry Dreyfus. U. S. 2,088,642, Aug. 3. Making cellulose derivative foils by extruding a solution of the cellulose derivative into a coagulating bath comprising an aqueous salt solution in which the concentration progressively decreases along the path of the foil.

STENCIL SHEETS. O. Schenck and K. Stickdorn. U. S. 2,088,764, Aug. 3. Cellulose ester coatings for stencil sheets are compounded with a long chain alcohol or glycol such as dodecyl alcohol, octadecenediol or octadecanediol, which will not impart an unpleasant odor.

LAMINATED PRODUCTS. Jas. V. Nevin. U. S. 2,089,034, Aug. 3. Sheet materials to be laminated are assembled with an adhesive and supporting layer comprising a fabric impregnated with an initial resin condensation product, dried and rehumidified to 20–40% moisture content, the bond being effected under heat and pressure to complete the resinification.

INSULATED CABLE. Moyer M. Safford (to General Electric Co.). U. S. 2,089,073, Aug. 3. A cured flexible rubber-like alkyd resin composition for insulating electric cables; if overheated the material evolves a gas which will not support combustion

RESINS FROM GLYCOL. T. F. Bradley (to Ellis-Foster Co.). U. S. 2,089,181, Aug. 10. As new resins or balsams, the diethyleneglycol ethyl ether esters of polycarboxylic acids.

ELECTRICAL RESISTOR. E. C. Ragatz and B. F. Tellkamp (to Allen-Bradley Co.). U. S. 2,089,425, Aug. 10. A molded resistor having as binder a thermoplastic rubber-synthetic resin composition containing no sulphur and capable of melting without loss of electrical properties.

POLYSTYRENE. H. Staudinger and W. Heuer (to I. G. Farbenindustrie Aktiengesellschaft). U. S. 2,089,444, Aug. 10. A product of the interpolymerization of styrene with 0.05 to 10 % of divinylbenzene.

VINYL RESIN. Maurice Belloc (to Societe Nobel Francaise). U. S. 2,089,530, Aug. 10. Condensing polyvinyl acetate with formaldehyde in acid solution to make new resins.

PRESSUREPROOF INSULATION. Otto Lang. U. S. 2,089,751 and 2,089,752, Aug. 10. Insulation adapted to withstand heat and pressure in an electrolytic cell is made of a rigid supporting skeleton of asbestos and a hydraulic cement, impregnated with a thermoplastic cellulose ether such as benzylcellulose or ethylcellulose.

VARNISH RESINS. Carleton Ellis (to Ellis-Foster Co.). U. S. 2,089,828, Aug. 10. Condensing xylenol or other phenols with the mixed aldehydes derived from petroleum oxidation products, combined with a drying oil, or condensing the phenol with acetaldehyde and a drying oil and then with formaldehyde.

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NEWS and NOTES

G-E Plastics activities consolidated

The administration of all plastics activities of the General Electric Company have been consolidated at Pittsfield, Mass., and the company's construction materials sales division, at Bridgeport, relieved of the responsibility of plastics sales, it has been announced by C. E. Wilson, G-E vice president. The change was made in the interest of increased coordination and efficiency.

The appointment of G. H. Shill as manager of the plastics department, with responsibility for all sales, engineering and manufacturing, has been confirmed by Mr. Wilson. Headquarters of the department will henceforth be at 1 Plastics Avenue, Pittsfield. K. W. Nelson, formerly manager of G-E automotive product sales, in the appliance and merchandise department, has been appointed sales manager of the plastics department.

President of Marblette Corporation dies

Svend Hansen, president of Marblette Corp., passed away in Stockholm on Sunday, August 8. Mr. Hansen, who had been in ill health for some time, was enjoying a combined business and pleasure trip through Europe, where he had planned to remain until sometime this fall.

Gering offers granulating service

Increased interest and production in injection molding has created a demand among molders for granulating equipment and service for molding scrap. Thermoplastics, if flash is kept clean and colors assorted, may be reground and used again with no loss of physical properties of the material. Gering Products, Inc., dealers in sheets, rods and tubes, offer a complete granulating service for all types of injection molding scrap. The company also purchases scrap material.

Color highlights

Twelve color highlights in woolens for late Fall and early Spring have just been issued to members of the Textile Color Card Association, according to Margaret Hayden Rorke, managing director of the organization. Spotlighted in this new collection are important advance color notes for Spring, as well as leading tendencies emphasized at the recent Paris openings. *French Sapphire*, for example, expresses the great favor for vibrant purplish blues, while *Fuchsia Rose*, a vivid cerise hue, also reflects this smart purplish influence.

A novelty tone expected to have strong fashion endorsement is the animated bluish green called *Canard*, meaning "Duck" in French. *Chantilly Green* a more subdued shade of slightly bluish undertone, also reveals a very new trend. *Vintage Wine* interprets the important *Bordeaux gamme*, which is receiving strong sponsorship.

Plastics manufacturers whose materials enter into the fabrication of buttons and other style merchandise as well as decorative parts for interior decorator's merchandise, will do well to follow the releases of the Textile Color Card Association and provide colors for the market this service creates.

Conner vice president of Colt's

B. F. Conner was elected vice president of Colt's Patent Fire Arms Mfg. Co. at a recent meeting of the directors. For many years Mr. Conner has been manager of the plastics division of this company.

Marblette opens Canadian office

Marblette Corporation, manufacturers of cast resins, has opened an office in Suite 602, Central Building, 45 Richmond Street, Toronto, Ontario. This office will be in charge of H. Cheer who will handle all sales throughout the Dominion of Canada.

New address Detroit Macoid Corporation

The Detroit Macoid Corporation announces its removal to a new plant especially designed to meet the needs of a rapidly growing business. The change was effected August 16th. New address is 12340 Cloverdale Avenue, at Fullerton, Detroit, Michigan.

Payne president Advertisers' Association

H. D. Payne, advertising manager of Chicago Molded Products Corp., was recently elected president of the Engineering Advertisers' Association of Chicago.

Woops!

It never occurred to me that our readers paid any attention to such minor details as the diameter of a tomato, but when we let the word "diameter" slip in when "circumference" should have been used in the article by Franklin Brill, General Plastics Inc., describing the Barnham Tomato Juice Dispenser, you should have heard the fuss.

Now, just for those who hanker for all the gory details, let's get the record straight: The globe of the tomato measures $48\frac{5}{8}$ in. around its equatorial section; that is, horizontally at its greatest circumference; and 38 in. in circumference when measured north and south through both poles. The complete unit with rubber feet stands about 17 inches high, not including the stem. If you really want to know the diameter, just figure it out.

So sorry!

In the Plastics' Progress section of our August issue we said that the Star Fuse Puller (Item 5) was manufactured by National Vulcanized Fibre Co. Now Kuhn & Jacob Moulding & Tool Co. writes to point out that this device was molded by them, so we must have been wrong. Anyway, the semi-cured Phenalite which gives the Bakelite molding its reinforcement was made by National Vulcanized Fibre Co., so we were only half wrong.

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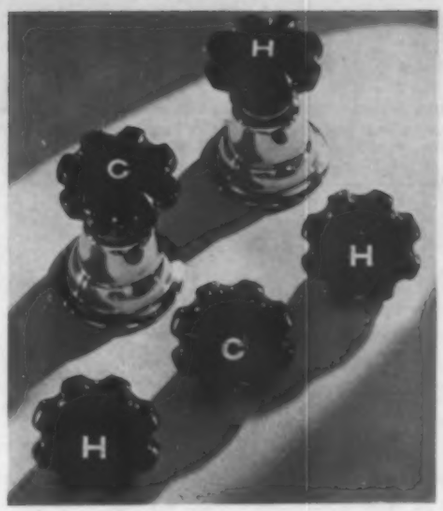

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. . . for American Insulator Corporation has made more handles than most of the country's molders *combined*. Most stove handles carry the AICO brand. Controls on your car window work from an AICO handle. And, now, if you put in new faucets get the best on the market by getting these AICO—molded Tenite handles, made for our client, Republic Brass.

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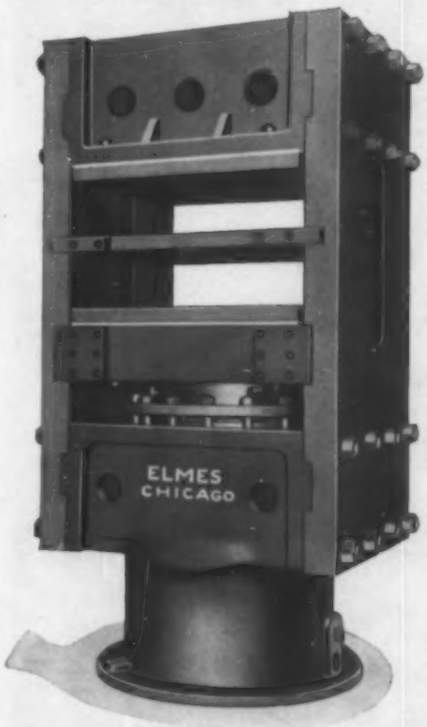
HYDRAULIC MACHINERY SINCE 1893 ELMES CHICAGO PRESSES FOR RUBBER CURING ARE OF HEAVY STEEL PLATE



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BOOKS and BULLETINS

Booklets reviewed in these columns will be sent without charge to executives who write for them on their company letterheads. Other books will be sent postpaid at the publishers' advertised prices

Plastics in the School and Home Workshop

by A. J. Lockrey

Published by Governor Publishing Corp.

Price $2.50

The preparation of this 228 page book on cast resin materials and their method of fabrication will be of considerable interest to homecraft enthusiasts and students of industrial design.

Mr. Lockrey has directed his efforts toward the amateur and speaks of the materials in easily understandable terms. Those who have never heard of cast resins, who are not familiar with their properties and characteristics, will discover that this story on Plastics answers all questions simply.

The book is divided into twelve chapters, namely: a new crafts material; equipment required; machining operations; carving, cementing, bending, embossing, inlaying; finishing processes; commercial processes; hand-tool projects; how to design and purchase economically; findings and supplies; research, unusual uses and the future. The book also includes 83 illustrations.

Institutional booklet by Celluloid

Celluloid Corporation has published an institutional booklet which recounts their early experiences in the plastics field and points out that despite their appellation "Grand-Daddy of 'em all" they are afflicted with a keen young desire to march ahead toward better materials and better methods.

Celoron coupling

The Continental-Diamond Fibre Company has recently published a folder describing Celoron molded plastic couplings. This is a sprocket coupling of laminated or molded macerated synthetic material and is widely used for the construction of silent gears and valve discs. The material is not affected by hot or cold oil, water, gasoline or many acids and has a tensile strength of 10,000 pounds per square inch; with a flexural strength of 20,000 pounds per square inch; and a compressive strength of 38,000 pounds per square inch. The folder describes the various advantages of this type of phenolic coupling gear and lists a specification chart with photographs of the coupling and a drawing of its cross sections.

Catalog of plastic novelties

Plastik Incorporated has issued a catalog of its cast resin specialties which are available from stock. The Catalog illustrates such items as hand fashioned dice, pencil sharpeners, pen holders, and other novelties.

SHOP EQUIPMENT

Abrasive Forming Machine

The Abrasive Forming Machine, pictured above, which was recently introduced by the Engineering Laboratories, Inc., forms balls, handles, knobs, acorns and all such shapes that may be regularly formed in a turning machine from round rods.

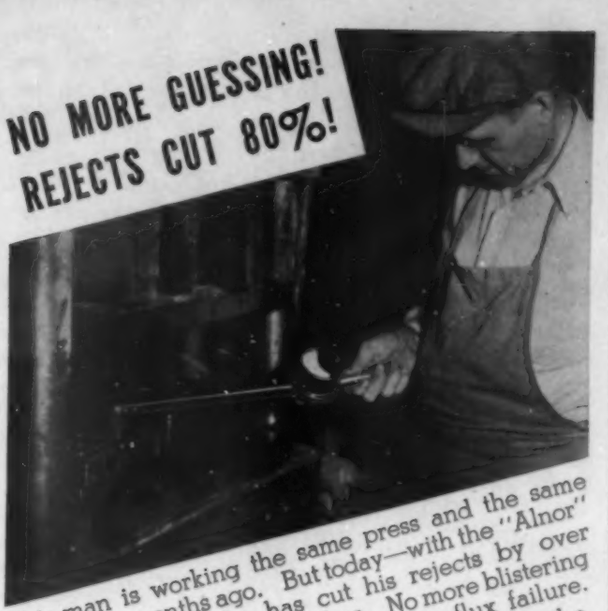
The machine is fed from a hopper which holds about one hour's supply of material, and the objects are automatically formed by an abrasive wheel which has been previously shaped to produce the object required. Since the operation is fully automatic, no attention is required to operate the machine which will continue to produce the objects for which it is adjusted as long as the hopper is kept filled. This means that labor cost is almost negligible since not more than one hour's attention during an entire day, is required to keep this hopper filled.

The production of one-half inch round balls is approximately one hundred gross per day at the approximate labor cost of one hour. These balls are formed true and round and are free from all scratches, making it possible to give them a high finish in a shorter time than is usually required for such work when turned by conventional methods. The material is formed wet, the water supply being extremely small, in fact less than the usual amount required in an abrasive cut-off machine.

The machine can be changed over from one shape to another in about one-half hour's time and additional wheels turn out different shaped objects.

A patented combination makes it possible to form and cut off handles with squared ends at one operation and many jobs are now being done in a rod turning machine where drilling, counterboring and certain hobbing operations are performed at the same time, where the major labor cost is accounted for in the turning and forming operation which this machine can reduce.

NO MORE GUESSING!
REJECTS CUT 80%!



This man is working the same press and the same mold as six months ago. But today—with the "Alnor" Portable Pyrocon—he has cut his rejects by over 80%. No more dogskin finishes. No more blistering and cracking. No more pitt marks or flux failure. Step up your output and keep trouble away from the press with "Alnor" Pyrometers . . . available in a wide variety of permanently mounted and portable types to meet every need.

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. . . . . an unruly offspring which is continually causing trouble? One customer may say, "It's not strong enough to hold up," another, "It costs too much," and still another, "Give me something more attractive."

Here's a wide open opportunity to submit your problem to K & J engineers. If it can be molded we'll do it. If it can't, we'll tell you and possibly suggest changes that will permit molding. It will cost nothing to find out. Just send your blueprints.

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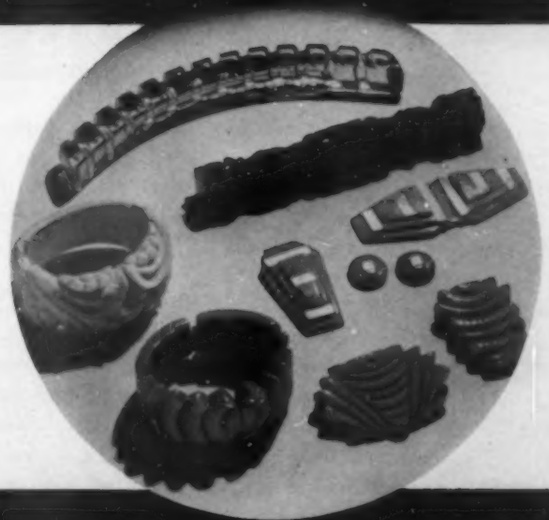

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1100 13TH ST. Rracine, Wis.

PLASTIC MOUNTS FOR PLATED SPECIMENS

(*Continued from page 48*) success in making mounts, according to information provided by the New Jersey Zinc Company. Besides avoiding the disadvantages of metal named, the plastics are hard and polish well.

A convenient mold for mounting is shown in an accompanying illustration. The mold itself is a steel sleeve with one-inch straight bore. Surrounding it is an electric heating element arranged in parallel with a variable external resistance and switch. Leads for the electric heating element and for a thermocouple embedded in the wall of the cylinder are carried out through the handle. In loading the mold, a steel base plug is placed in the bore and covered with an insulating block to keep heat from flowing to waste through the base plug. Specimens are then set on the block with their roughly ground surfaces face down. Granular plastic is then poured in, to a depth equal to three times the height of the finished mount. The plunger is inserted and a pressure of about 4000 lbs. is applied, after which the current is turned on and heating takes place. When the required temperature is reached it is held for 2 min. while the pressure is increased to 5000 lbs. Current is then turned off and, when the mount formed is cool, the mold is placed on the ejector plate and the injector plunger is used to press the mount out of the mold. The mount with the specimens firmly embedded is ready to polish.

PLASTICS AT ROCHESTER A. C. S. MEETING

(*Continued from page 39*) acid medium a sensitive colorimetric test has been developed which distinguishes glycerol from ethylene glycol even in very dilute concentrations. Certain other color reactions were reported for distinguishing polyhydric alcohols other than glycerol and ethylene glycol.

ETHYLCELLULOSE PLASTIC, Donald L. Gibb and Russell Bradshaw. The effects of various plasticizers on flow, softening point, and hardness of ethylcellulose plastic, and of some of the plasticizers in varying amounts on the same properties were considered. The compatibility of plasticizers and resins with ethylcellulose and the solubility of this compound in certain plasticizers were reported. The work previously published by Kauppi and Bass has been extended to plastics, showing that these relatively simple tests on foils can be interpreted to give information on the properties of the plastic material.

THE PLASTICS INDUSTRY AND ITS RAW MATERIALS DEMANDS, by G. J. Esselen and F. S. Bacon. Aside from the cellulose and protein plastics, the synthetic resins or plastics can all be derived from the basic materials, coal, lime, water, air and salt. The "intermediates" are for the most part simple substances, for example, olefins, such as ethylene which may be obtained from cracked petroleum or other hydrocarbon gases. Other examples are formaldehyde, urea and phenol, which are to-day synthesized in huge quantities. The effect of the development of particular resins on the demand for certain basic raw materials was discussed. The effect of the availability of raw materials and the limitations of molding machinery on the future growth of the plastics industry were also considered.

FILM FORMING METHODS, by Harold A. Levey. Methods for the conversion of organic plastics into the form of thin self-sustaining films were discussed.

FILM FORMING SURFACES, by Harold A. Levey. The relationships existing between the physical and chemical characteristics of plastic compositions and the types of surfaces upon which thin films of these compositions may be formed, dried and subsequently stripped, were considered. Metallic, non-metallic, organic, and liquid media as forming surfaces were included in the discussion.

RESINS FROM THE HEXAHYDRIC ALCOHOLS, MANNITOL AND SORBITOL, by R. M. Goepp, Jr., and K. R. Brown. Technically satisfactory ester gums and alkyd resins can be made from mannitol and sorbitol by using from 2.25 to 3.0 acid equivalents per molecule of hexahydric alcohol, and by controlling purity of ingredients, heating schedules, agitation and atmosphere. Ester gums thus prepared at 285–300° C. have acid numbers below 20, standard rosin colors G to H, and softening points between 120° and 140° C. (ring and ball), with properties intermediate between glycerol ester gums and modified phenolic types. Air-drying alkyds from sorbitol at 200–225° C., when tested in synthetic enamels and baking enamels, compared favorably with corresponding glycerol resins, and surpassed the latter in resistance to cold check, salt spray, humidity and hydrocarbons. The saponification of certain sorbitol alkyds or certain ester gums yields qualitatively a tetrahydric monoanhydro sorbitol or sorbitan, $C_6H_8(OH)_4O$, isolated as mono-*m*-nitrobenzal derivative, m. p. 194° C. This same sorbitan can be isolated from the mono-anhydro sorbitol fraction of b. p. 235–250° C. at 3 mm., made by heating sorbitol with mineral acids. From the saponification of glycerol ester gums and alkyds, or of erythritol alkyds, only the original polyhydric alcohol could be recovered. The fact of internal etherification, therefore, explains the qualitative and quantitative differences between hexahydric and lower polyhydric alcohols in the formation of resinous esters.

THE EFFECT OF NON-VOLATILE MATERIAL ON SOLVENT BALANCE, by John B. Dorsch and J. K. Stewart. The following relationships exist between mixtures containing no non-volatile material and mixtures containing non-volatile material such as nitrocellulose or resin. During the first 50 percent of evaporation the composition of the solvent-diluent mixture was apparently unaffected by the non-volatile material. In the last 5 percent of unevaporated liquid mixture apparently no hydrocarbons were present. Apparently in solvent-diluent mixtures containing only nitrocellulose as the non-volatile material, the last few percent of hydrocarbons evaporate at a relatively slower rate. If ester gum is also present, butyl alcohol is held back more than the last few percent of hydrocarbons. The

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The Clean Buffing Compound

LEAROK has no "free grease" in it. It is clean. It doesn't get into crevices and ornamentations. This, coupled with its excellent buffing properties, make it ideal for finishing plastics. LEAROK can be obtained tinted to match the color of the finished article.

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ingredient held back least by the non-volatile material was butyl acetate.

INFLUENCE OF PHENOLIC RESINS ON LINSEED OIL VARNISHES, by V. H. Turkington, R. C. Shuey and L. Shecter. The changes in physical properties produced on cooking various linseed oil-phenolic resin compositions were described. The properties investigated included viscosity, refractive indexes, density, iodine number, tensile strength and elasticity as influenced by change in resin concentration.

ESTIMATION OF TAUTNESS OF AIRPLANE FABRIC DOPED WITH VARIOUS PLASTICS, by G. M. Kline, H. F. Schiefer and C. G. Malmberg. A spring-loaded instrument developed to measure the relative tautness of doped fabrics in both horizontal and vertical positions and, therefore, applicable to the determination of the tautness of fabrics on wing and fuselage sections of airplanes, was described. The tautness values obtained with dopes prepared from cellulose acetate, cellulose nitrate, cellulose nitroacetate, cellulose acetopropionate, cellulose acetobutyrate, benzylcellulose, ethylcellulose, chlorinated rubber and various acrylic and methacrylic resins were reported.

KNOWING WHEN TO REDESIGN

(*Continued from page 21*) bulb. A micrometer tuner at the rear of the unit makes it possible to secure the correct amount of light for the particular dental operation being performed.

Since the aluminum reflector would ordinarily radiate considerable heat, unless thoroughly insulated, the design incorporates a liberal air space between the reflector and the outer shell. The inner aluminum shield contains a number of rectangular vents in the front, while the outer molded shell is open at the opposite end. This provides a free circulation of air, keeping the light at a comfortable temperature at all times. In addition, since the molded plastic material is a slow conductor of heat, the housing is not likely to become too warm.

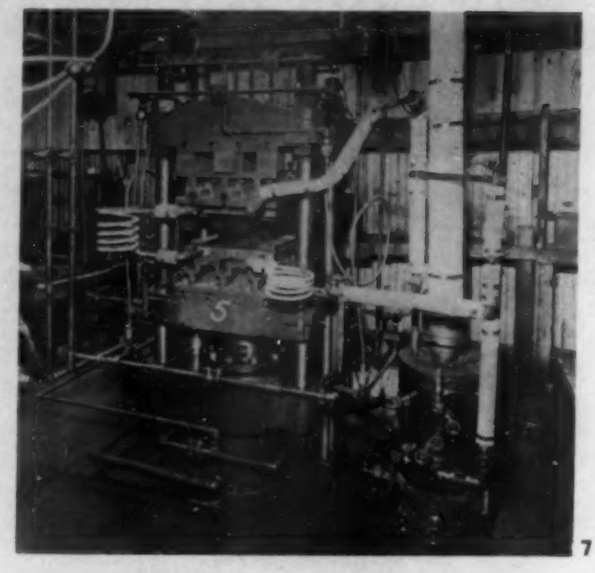
A unique method of fastening the shield to the light socket by means of a spring, holds the shield firmly in place, yet this method permits a quick and easy removal of the bulb when the need for replacement arises. This development is the result of collaboration between the company's engineers and the molder.

Attached to the front of the molded shield is a small hinged deflector, which keeps the light out of the patient's eyes when the light is thrown upward during operations on the upper jaw. Two chromium plated spring clasps form part of the hinge for this deflector, so that it may serve as an x-ray reading box. In the latter instance the x-ray film is held constantly before the operator, and will thus save the annoying interruption of having the dentist turn away from his work to examine the film.

This new dental light illustrates in a striking way what can be accomplished by close cooperation between the engineer, the industrial designer, molder, and the manufacturer of plastic molding compounds.

STEAM FROM SMALL BOILERS

(*Continued from page 46*)



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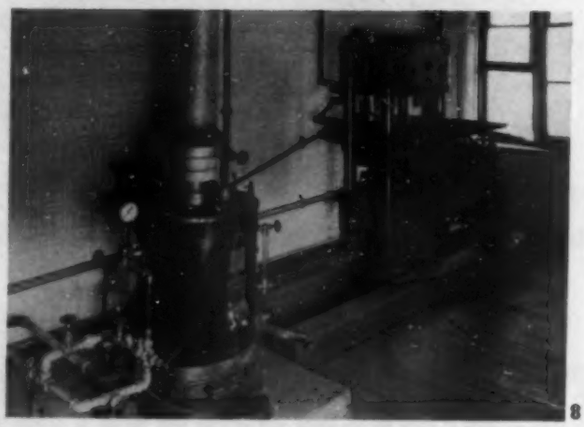

8

7. Close-up of a press showing the boiler application and also the flexible copper tubing connections which enable the platen to be raised or lowered in the opening and closing of the press.
8. Application of low type boiler to platen heated press

reducing valves or boiler feed pump equipment, as much as $48.00 per press can be saved over the cost of a central boiler installation. This saving will compensate for the increased cost of boilers, making the average cost per press approximately the same in either case.

From data collected over a period of three years, the maintenance charges on small boilers individually attached to platen presses are practically negligible. In the case of large central boilers, the cost of repairs of traps, reducing valves and pumps, amounts to a considerable sum in the course of a year. In some localities, the matter of licensed attendants must also be considered when using large boilers; while, with the small units, this is unnecessary. With individual boiler press units, there need be fuel consumption only when the press is in service, much the same as individual electric motors for machinery drives.

THE SIMPLEST, MOST SERVICEABLE MOLDED LIGHT SHADE

is a product of the

PLASTIC MOLDING CORPORATION

Molded with an integral thread, the milkwhite Beetle light shade and reflector is the simplest and most easily attached shade we know of. A twist of the wrist and it is threaded firmly to the bulb socket. No projections or edges to catch dust. No set screws to get loose.

Available to interested manufacturers at a remarkably low cost in white or tinted plastics. Write today for full details.

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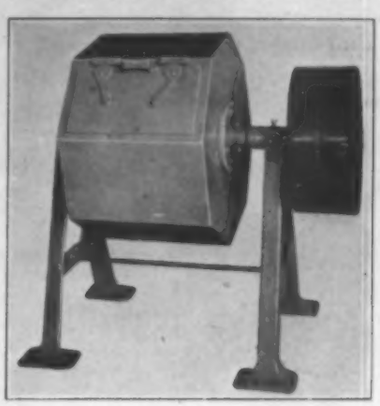
SANDY HOOK, CONNECTICUT

FOR ABRASIVE OPERATION



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BARREL
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Single mounted unit is illustrated. May also be obtained mounted doubly.

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2—Cuts time of operation.
3—Will not stain articles of white and delicate pastel shades.
4—May be equipped for either wet or dry tumbling.

We present this as a perfected barrel, thoroughly tested in actual production over a period of more than three years. Further details, together with folder on Siebert line, will be sent on request.

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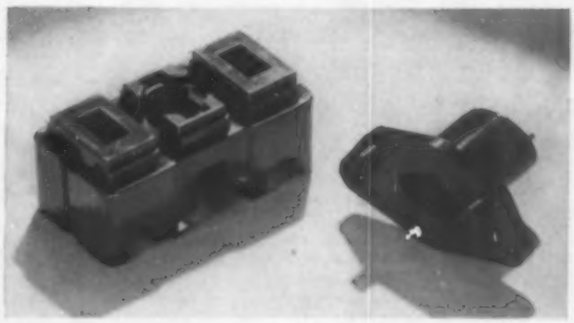

For the past eighty-one years thousands of manufacturers have found that they gain a great advantage when they specify Waterbury Plastics. Given a choice of any of the accepted commercial compounds and the finest of skilled craftsmen who have the greatest and longest experience in the molding industry, they are guaranteed the best. The next time you buy plastic parts call in a Waterbury Plastics Engineer and you too will be sure to get better molded plastics.

PLASTICS DIVISION

THE WATERBURY BUTTON COMPANY
EST. 1812
WATERBURY CONNECTICUT

CASTING RESINS IN RUBBER MOLDS

(*Continued from page 23*) other hand, the flexibility of the mold permits casting shapes that depend upon undercuts for their decorative effect which could not possibly be molded by conventional methods in a metal mold.

It is possible to get almost any desired color, or any combination of colors in mottled effects and they are

Fig. 6

WEATHEROMETER TEST ON FIVE PIECES OF "MOLDITE"

We are submitting the results of our examination of five pieces of "Moldite" in a six-day test in a Standard Atlas Weatherometer. The samples were received on July 12, 1937.

The daily treatment consisted of 16 hours exposure to ultra-violet light with wetting every 20 minutes. The temperature was approximately 100 to 110°F. and the samples were stored at substantially freezing point in an electric refrigerator. The observations made on the samples at the end of the test period were as follows:

1. *Red Block*—Slight loss of color and decrease in transparency.
2. *Green Block*—Marked loss in color penetrating to a depth of about 1/4 inch. The surface gloss was retained but there was a slight decrease in size.
3. *Moulded Rose*—A yellow color developed from the original cream and a brownish cast appeared on some parts of the surface. The shape of the mould was slightly altered by warping.
4. *Cream Cameo*—A brownish color developed—definitely darker than originally. One small check appeared on the back of the piece (side away from the light). There was a slight increase in size.
5. *Blue Black Cameo*—The color was not perceptibly altered. The side and back showed numerous cracks extending to a considerable depth. No cracks appeared on the face which was next to the light.

In general the surface condition of the samples from the standpoint of freedom from checks and retention of polish was good.

The Weatherometer test employed in this investigation is based upon outside weather conditions of rather extreme climatic variations. These conditions are obviously much more destructive than the conditions met in any type of indoor use or any outdoor use such as would be encountered if the material were worn as an ornament on clothing. We believe the results of our tests indicate that the material will give satisfactory performance when used for interior purposes or when made into ornaments to be worn on clothing whether for use indoors or outdoors. It was not indicated that occasionally and unprolonged exposure to direct sunlight or rain would cause any damage to the physical properties of the plastic.

Respectfully submitted,

(*Name of Laboratory on request*)

reasonably fast. As the report will indicate, there is opportunity for improvement of pigmentation although it must be born in mind that the tests to which the materials were subjected were more severe than they are likely to encounter in any ordinary commercial use.

There are almost illimitable possibilities of design for decorative applications of the material and it is in this field that the process gives greatest promise of growth and expansion as minor difficulties are overcome. This type of resin can be made either translucent or opaque as occasion demands and when the rubber mold is carefully made a reasonably good surface appears on the product so that little finishing is required. Small parts may be tumbled and ashed, while larger pieces may be quickly polished on a buffing wheel. Pieces can be wiped with contrasting colors and the high spots buffed to represent age, or they may be polished to the high gloss which is a characteristic of this type of resin. The finished product can be drilled or sawed, and the metal attachments such as pins and clips may be applied in the same way they are used with cast resins which have been fabricated from rods and tubes.

The bag tops which are illustrated at the beginning of this article (Fig. 2) are typical examples of the economies of this molding process. To engrave them on grinding machines limits their production to hand operations and undercuts would prevent their being molded in any other than a flexible mold. Then, too, when handles of this sort are molded each one is like every other one from the same mold which is important to the manufacturer who is meticulous about the product he turns out. The little variations which occur when hand operations are employed are entirely absent.

The bas-relief plaque (Fig. 3) which is fourteen inches in diameter illustrates the decorative opportunities offered by the process where undercuts are no problem. And the dog's head (Fig. 1) which is more than an inch and one-half thick, with a tremendous undercut behind the ear, presents no difficulties in production with a rubber mold.

Buttons of intricate design may be seen in Fig. 4 some of them with the most delicate fretwork which leaves little more than a thread of solid material to hold them together. These have been produced and are shown simply as examples of what can be done rather than as practical applications of the process.

AUTOMATIC MOLDING—Part I

(*Continued from page 42*) all characteristics of molding material selected for the use.

A ten-ton capacity press can mold parts up to ten square inches, and the operating cost of such a press is less than one cent per hour, consisting substantially of the cost of the electric current. The press is completely automatic, operates electrically, is self-contained, with no hydraulics or valves. Although various heating means can be incorporated, such as steam or gas, electrical means are, doubtless, most advantageous from the standpoint of the unit's being completely self-contained (unless high pressure steam is available).

The press requires only one electric connection to supply current, and a compressed air supply to remove the molded part and clean the mold. Particular attention has been paid to interlocks or safety features, which protect press and molds from damage in operation. Ac-

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tual experience has established the efficiency of these safeguards, no damage having occurred in molding a variety of parts in more than a year and one-half.

As mentioned before, and particularly stressed again, simplicity and reliability were the main requirements influencing design. Every effort has been made to reduce to the minimum operating, supervision, and maintenance costs. Because of the basic principle involved in the development of these automatic presses, molding costs can be very accurately determined, and unforeseen and overhead items, such as shut-downs, replacements of broken parts, spoilage of pieces, are practically eliminated.

All the automatic molding machines built up to the present, for the sake of simplicity in design and reliability of performance, have been developed for single cavity molds. It is apparent, however, that production should be doubled with two cavities or quadrupled with four, etc., and preliminary work looking to further development along these lines is under way.

Increased production can also be attained with single cavity presses by simply increasing the number of presses, which would consist of any required number of fully independent units. With this equipment no changes or stoppage of one unit would, in any way, affect the operation and production of the others.

Editor's Note: In a concluding article to appear in our October issue, Mr. Zelov will discuss more fully the advantages and limitations of Automatic Molding and give cost figures that should be of utmost interest.

PLASTICS: NO. 2 REFRIGERATOR MATERIAL

(*Continued from page 19*) which might impair the action of the valve. Accessories are ideal applications: interior light housings, shades, thermometers, thermostat covers and the like are molded for reasons of insulation, non-corrosion, sanitation and translucency.

Looking ahead

What's ahead for plastics in refrigeration? Will plastics go much further, eventually forming major portions of domestic cabinets and mechanisms? Plastics people think so, and expect it within a few years. Here's how they reason:

There are light-colored plastic materials already developed but not yet announced which can be used to form large portions of refrigerator interiors. For instance, the entire freezing unit housing can be a one-piece molding, the advantages being elimination of rust and corrosion, and simpler fabrication. This same material will form the crispers themselves, replacing porcelain-enamelled iron by reason of lighter weight, resistance to chipping and possible economy of manufacture. The next step will be forming the interior lining of the smaller boxes, in two or more pieces, perhaps, and the material's formability may lead designers to mold door interiors with more food-carrying capacity and convenience.

With more and more interior equipment being furnished with today's box it is not inconceivable that

Another Electrolux part is a pendant door-handle with a molded urea grip threaded to a die-cast lever and escutcheon

tomorrow's refrigerator will be completely equipped with rectangular plastic dishes, bins, jars and trays. They will be scientifically designed to hold the foods used by the average householder in a minimum of space, and will probably use the now wasted underside of every shelf to increase capacity. Perhaps a set of light-weight plastic dishes with clamps on top will slide back and forth on the under side of the shelf, giving manufacturers a sales argument as potent as the Shelvador.

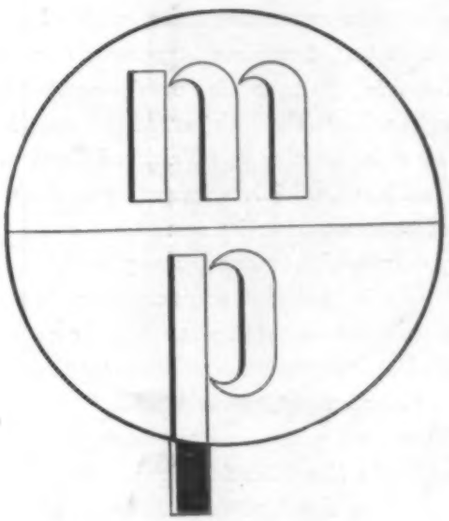
Pieces equivalent in size and shape to the lift-top doors on small boxes have already been molded, and can be made in one piece with breaker strip, bead and attachment inserts integral with the door. Since there can be no chipping of the luster on a plastic piece, doors of this type should be much more satisfactory and sanitary than coated materials.

Other forecasts

In boxes having food-freezing compartments, there will be other plastic applications, ranging from insulating doors to trays and dishes. Interior lights will become standard equipment on sides as well as top of box, and diffusing shades will be molded in a manner similar to those on modern cars. Ice-cube compartment doors will be molded for decorative reasons, and flexible plastics may be used for quick-ejecting cube trays, when water absorption on this type of plastic is no longer a problem. Higher strength plastics will find uses on compressors and motors, and self-lubricating materials will be used at friction points and to eliminate metal-to-metal contact where parts are subject to wear.

Materials which are capable of filling these new shoes are not all available on the open market at present, but are about to "emerge from the test tube" or final development stage. When they do there will be a period devoted to fabrication-experiment, but within a few years one may well expect to see many major refrigerator parts produced from plastics.

MODERN PLASTICS



CATALOG • OCTOBER 1937 • DIRECTORY

FOREWORD

In presenting the second annual **HANDBOOK AND CATALOG** number of **MODERN PLASTICS**, we have been guided largely by reader requests for its editorial content and it should be remembered that our readership represents an exceedingly broad range of executives and technicians in many fields of activity. For that reason some of the material may appear elemental to some of our readers whose interest in plastics is purely technical. On the other hand, some of the stories may seem to be "over the heads" of readers whose interests in these materials and their methods of manufacture and handling are concerned only with practical applications and utility. Since there is no middle road we could follow, we have attempted to present the new developments, both in materials and equipment, with graphic illustrations which instantly indicate the uses each type of plastic is best qualified to meet and we have supplemented this information with technical data to enable technicians, engineers and designers to base their choice of materials upon dependable comparisons.

The division of the book into seven sections, each of which is conveniently indexed on a separate title page, makes it possible to obtain complete information regarding materials, methods, equipment and developments by referring to that section in which the subject of interest is treated. This can be quickly determined by reference to the Table of Contents on pages 3 and 4.

The Plastics Properties Chart, which appears opposite page 120, is the most complete assemblage of comparative information ever attempted for those who use plastics in any way and has been completely revised since its initial appearance a year ago. While it is not entirely complete in its present form, much of the information missing last year has been supplied and a more uniform basis of standard comparisons has been established.

The Directory of Trade Names, (pages 341 to 342) together with names and addresses of manufacturers of plastics, has been rewritten to include only those materials referred to in the Plastics Properties Chart, which are available in the current market in the United States, supplemented to a limited extent by miscellaneous trade names of related products. The Buyers' Directory (pages 327 to 340) lists all manufacturers of materials, supplies, equipment, molders and mold makers together with consultants and industrial designers. They are grouped alphabetically under various headings and the information listed is authentic to the best of our knowledge, having been supplied by those whose names appear.

This second annual **HANDBOOK AND CATALOG** number has been made possible only through the generous cooperation and contributions of those authorities in the field who have written these informative articles for the benefit of our readers. A complete list of these contributors, together with their affiliations, appears on page 8. We take this opportunity to express our sincere gratitude to all of those who have given so unselfishly of their experience and time.

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